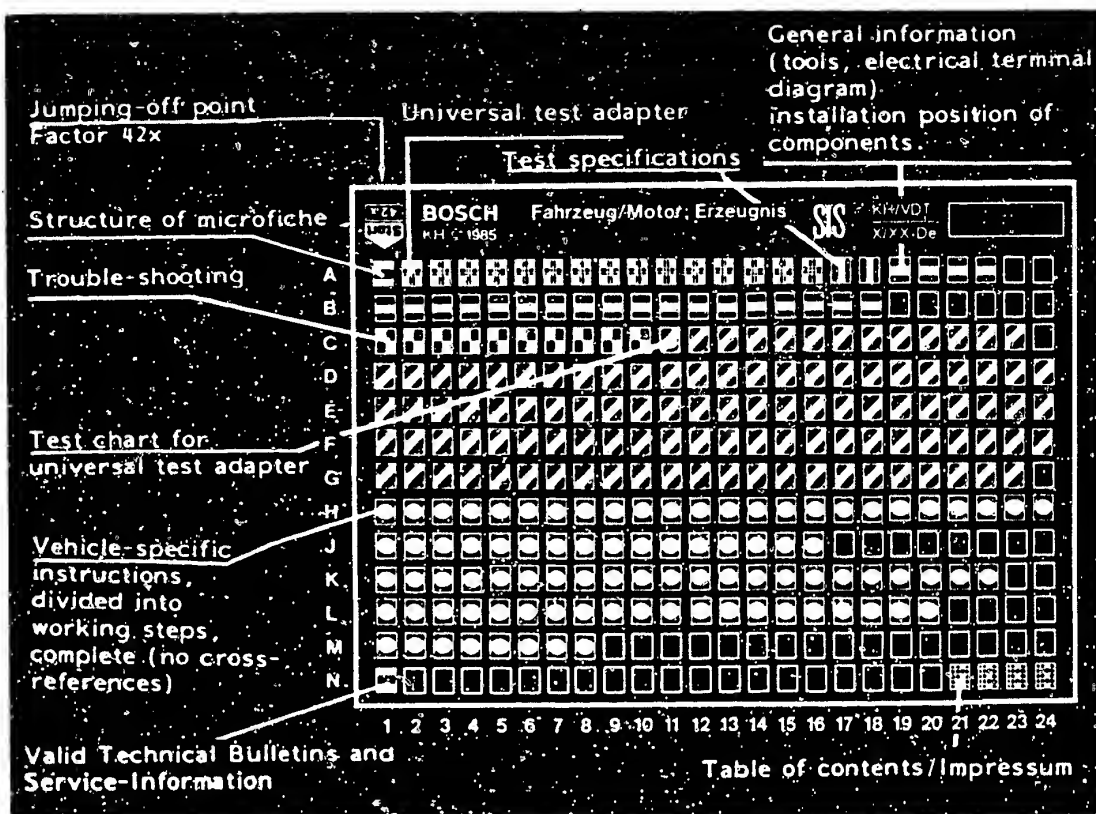


Structure of microfiche

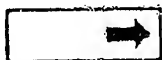


1. Read from left to right
2. Title of microfiche (appears on each coordinate)

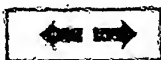
E16	Product/component/test step
	Vehicle/engine

Coordinate

3. Limits of section



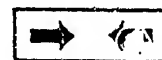
Beginning



Mid-section



End



One-page section

4. Purely vehicle-specific passages in the text are marked with a vertical bar.

5. Reference to relevant working steps in the test specifications, e.g. coordinate C6.

C6

A1

Trouble-shooting program



SPECIAL FEATURES

This microcard contains the testing and repair instructions for the Motronic in the

- Porsche 944 with 2.5 1/4-cyl. engine, lambda closed-loop control as of 3.82 and idle-speed control (as of 1.85).

Further modifications as of 1.85:

New control unit, new fuel-distribution pipe, new central-electrics box.

Countries where used: USA, Canada, Japan, Puerto Rico

1. RAPID DIAGNOSIS CHART FOR UNIVERSAL TEST ADAPTER

The following rapid diagnosis chart makes it possible for the experienced Motronic expert to quickly check the electrical part of the system with the universal test adapter.

The rapid diagnosis chart contains the following information:

- Switch settings on the universal test adapter
- Sequence of test steps
- Notes on how to operate the universal test adapter or other components
- Readings on the multimeter and motortester
- References to coordinates of the respective detailed testing and trouble-shooting program.

If detailed information and instructions are required, always proceed in accordance with the trouble-shooting program starting on Coordinate C1.

A2

Rapid diagnosis chart
Porsche 944 (USA)



Rapid diagnosis chart for universal test adapter

Test step	Switch position		Remarks	Test specifications (Reading)	for trouble-shooting see Coordinates
	V	Ω			
1	↓	1	Shift gear to neutral. Ignition off. Disconnect control unit and pump fuse No. 16. Measure insulation resistance of engine-speed sensor term. 8 against term. 5.	greater than 1 M Ω	C 18
2	↓	2	Measure insulation resistance of reference-mark sensor term. 25 against term. 5.	greater than 1 M Ω	C 22
3	↓	3	Measure winding resistance of engine-speed sensor term. 8 against term. 27.	0.6 ... 1.6 k Ω	D 3
4	↓	4	Measure winding resistance of reference-mark sensor term. 25 against term. 26.	0.6 ... 1.6 k Ω	D 8
5	↓	5	Measure resistance of engine temperature sensor (NTC II) term. 13 against term. 5.	at +15°C to +30°C: 1.45 ... 3.3 k Ω (temperature-dependent)	D 13
6	↓	6	Measure resistance of air temperature sensor (NTC I) term. 22 against term. 5.	at +15°C to +30°C: 1.45 ... 3.3 k Ω (temperature-dependent)	D 15
7	↓	7	Measure lead resistance term. 10 against term. 5. Maps connected for California and Japan version.	general: $\infty \Omega$ California/Japan: less than 10 Ω	D 17
8	↓	8	not applicable	-----	-----
9	↓	9	Accelerator in rest position. Measure resistance of idle contact term. 2 against term. 5.	less than 10 Ω	D 19
10	↓	10	Accelerator in full-load position. Measure resistance of full-load contact term. 3 against term. 5	less than 10 Ω	D 21
11	↓	11	Measure resistance. Ground term. 16 against term. 5	less than 10 Ω	D 23

A3

Rapid diagnosis chart
Porsche 944 (USA)



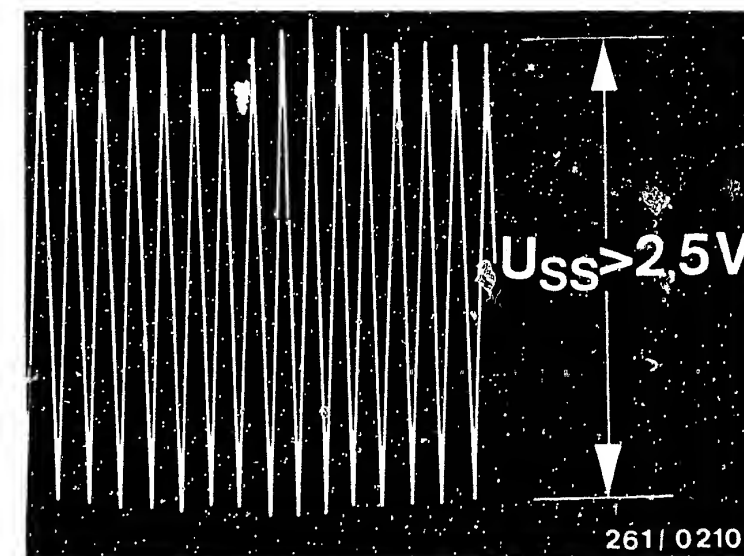
A4

Rapid diagnosis chart
Porsche 944 (USA)



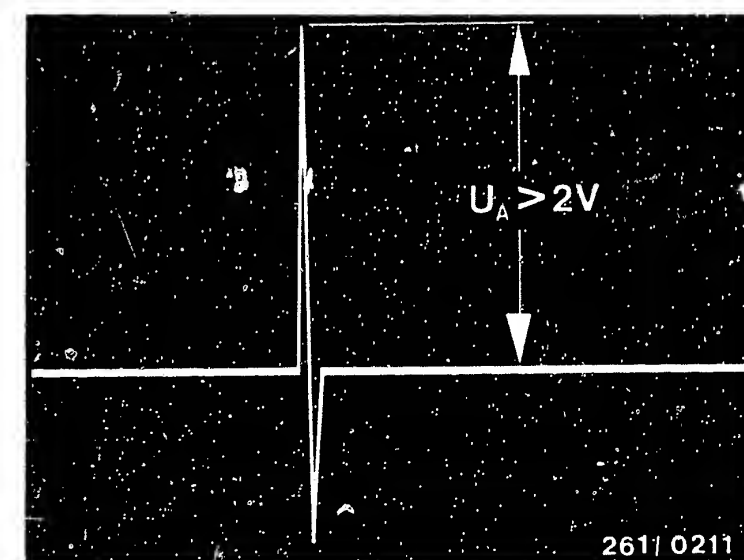
Rapid diagnosis chart for universal test adapter (continued)

Test step	Switch position		Remarks	Test specifications (Reading)	for trouble-shooting see Coordinates
	V	Ω			
12	↓	12	Measure resistance. Ground term. 17 against term. 5	<u>less than 10 Ω</u>	E 1
13	↓	13	Measure resistance. Ground term. 19 against term. 5.	<u>less than 10 Ω</u>	E 3
14	↓	14	not applicable	-----	-----
15	↓	15	Measure resistance of altitude sensor (switch) term. 28 against term. 5 Switch closed (above 1000 m altitude): Switch open (below 1000 m altitude):	<u>less than 10 Ω</u> <u>∞ Ω</u>	E 5
16	1	15	Measure signal with oscilloscope Engine-speed sensor term. 8 against term. 27. Shift gear to neutral and start.	see top diagram	E 7
17	2	15	Measure signal with oscilloscope at reference-mark sensor term. 25 against term. 26. Shift gear to neutral and start.	see bottom diagram	E 11



Engine-speed sensor signal

Reference-mark sensor signal.
Positive peak must come first.



A5

Rapid diagnosis chart
Porsche 944 (USA)



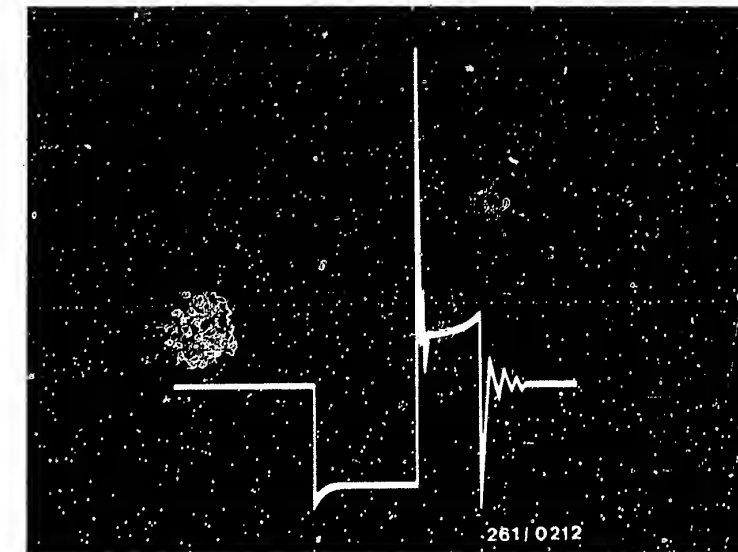
A6

Rapid diagnosis chart
Porsche 944 (USA)



Rapid diagnosis chart for universal test adapter (continued)

<u>Test step</u>	<u>Switch position</u>		<u>Remarks</u>	<u>Test specifications (Reading)</u>	<u>For trouble-shooting see Coordinates</u>
	V	Ω			
18	3	15	not applicable		---
19	4	15	If air conditioner installed: Measure voltage at air conditioner term. 29 against term. 5. Switch on air conditioner.	greater than <u>8 V</u>	E 15
20	6	15	Measure voltage of relay set at term. 35 against term. 5.	<u>10 ... 15 V</u>	E 17
21	7	15	Measure voltage of relay set at term. 18 against term. 5.	<u>10 ... 15 V</u>	E 19
22	5	15	Ignition off. Connect control unit and connect pump fuse. Ignition on. Measure ignition signal with oscilloscope. Shift gear to neutral and start. Control unit, ignition output stage term. 1 against term. 5. Evaluation: Signal present	see diagram	E 21



Ignition signal

A7

Rapid diagnosis chart
Porsche 944 (USA)



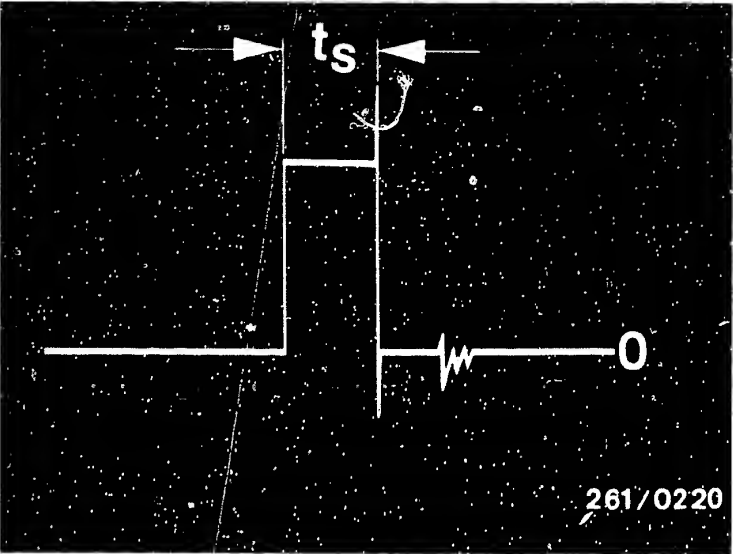
A8

Rapid diagnosis chart
Porsche 944 (USA)



Rapid diagnosis chart for universal test adapter (continued)

Test step	Switch position		But-ton	Remarks	Test specifications (Reading)	for trouble-shooting see Coordinates
	V	Ω				
23	8	15		Measure voltage at control unit term. 9 for air-flow sensor against term. 5.	greater than 8V For vehicles as of 1.85: approx. 5 V	E 23
24	9	15		Measure voltage of air-flow sensor at term. 7 against term. 5.	150 ... 250 mV For vehicles as of 1.85: 220 ... 280 mV	F 1
				Sensor flap in rest position: Sensor flap open:	greater than 7V For vehicles as of 1.85: greater than 4.5 V	
25/ 26	10/ 11	15		not applicable	-----	-----
27	12	15		Measure voltage. Starting signal term. 50. Term. 4 against term. 5.	8 ... 15 V	F 3
28	13	15		Measure dwell-period signal t_s of control unit with oscilloscope term. 21 against term. 5. Shift gear to neutral and start.	see diagram	F 5

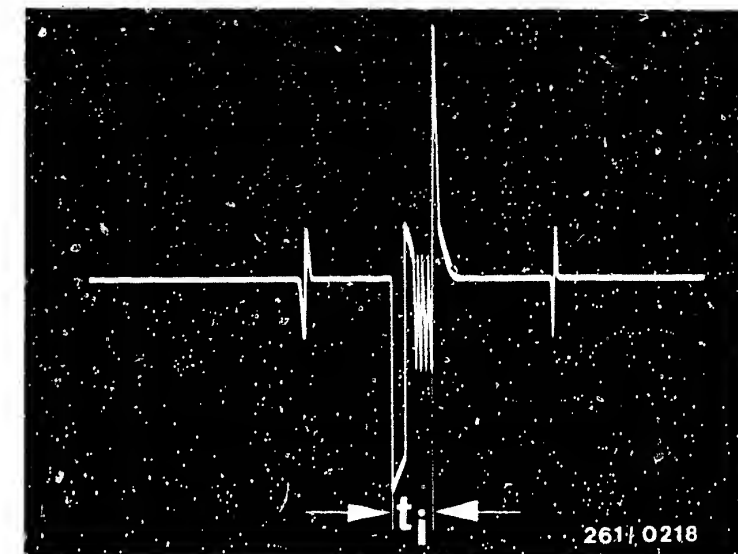


t_s = Dwell-period signal

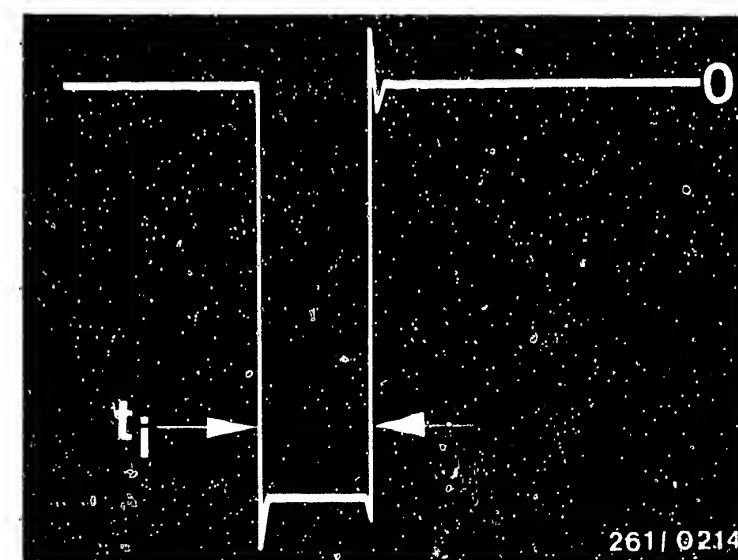


Rapid diagnosis chart for universal test adapter (continued)

Test step	Switch position		But-ton	Remarks	Test speci-fications (Reading)	for trouble-shooting see Coordinates
	V	Ω				
29	14	15		Measure injection signal t_i of control unit with oscilloscope term. 14. against term. 5. Shift gear to neutral and start.	see top diagram	F 7
30	14	15	T1	As 29, but after pressing button (NTC II, cold) duration of injection becomes slightly longer.		F 10
31	15	15		As test step 29, but test term. 15 against term. 5.		F 12
32	16	15		Measure injection signal t_i of control unit with oscilloscope term. 11 against term. 5. Shift gear to neutral and start.	see bottom diagram	F 14



t_i = Injection signal



A11

Rapid diagnosis chart
Porsche 944 (USA)



A12

Rapid diagnosis chart
Porsche 944 (USA)



Rapid diagnosis chart for universal test adapter (continued)

Test step	Switch position		But-ton	Remarks	Test specifications (Reading)	for trouble-shooting see Coordinates
	V	Ω				
33	17	15		Measure voltage at control unit term. 20 against term. 5. Connect pump fuse. Switch on ignition (testing of relay set).	<u>10 ... 15 V</u>	F 16
34	17	15		Measure voltage at control unit term. 20 against term. 5 (testing of pump control in control unit). Shift gear to neutral and start.	<u>max. 4 V</u>	F 18
35	17	15	T3	Ignition off. Connect pressure gauge. Switch on ignition. Press button T3. Read off fuel pressure.	<u>2.3 ... 2.7 bar</u>	F 20
36	17	15		Connect motortester. Connect CO analyzer to test connection before catalytic converter. Lambda sensor is open-circuited by test adapter. Firstly, perform CO measurement. Conditions: engine at normal op. temp., electrical devices switched off, ambient temperature +15°C...+35°C. Perform adjusting operations as quickly as possible. For vehicles as of 1.85: To check the idle speed, the idle-speed control must be switched off. On the test socket, connect term. B and term. C with lead.	<u>0.4 ... 0.8 vol.%CO</u> <u>Vehicles up to 1.85:</u> <u>850 ... 950 min⁻¹</u> <u>Vehicles as of 1.85:</u> <u>800 ... 880 min⁻¹</u>	G 3
37	17	15		Let engine run. Check spark advance at idle speed. Important! Idle speed must be correctly adjusted, otherwise different spark advance angles are indicated.	<u>0 ... 10°</u>	G 7
	17	15	T6	Check spark advance at full load. Set engine speed to 2400 min ⁻¹ and press T6 (full-load button).	<u>11° ... 21° at engine speed 2400 min⁻¹</u>	
38	17	15		Dwell angle at idle speed	<u>8° ... 15°</u>	G 9
				Dwell angle at 3000 min ⁻¹	<u>30° ... 45°</u>	

A13

Rapid diagnosis chart
Porsche 944 (USA)



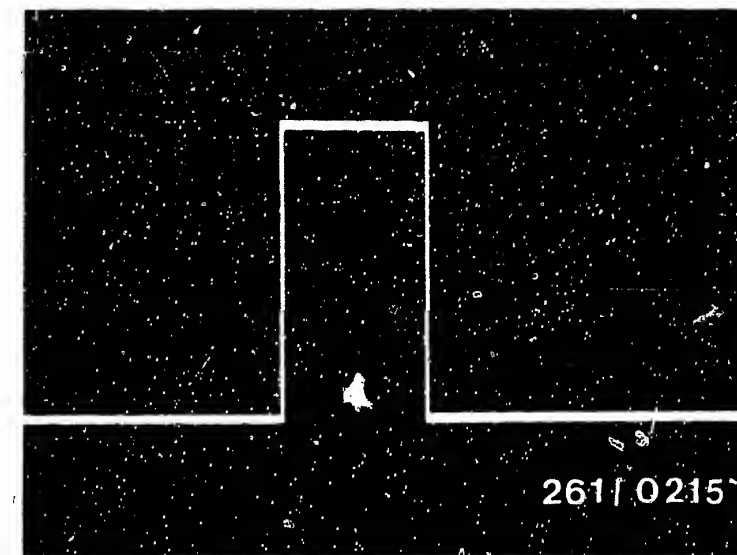
A14

Rapid diagnosis chart
Porsche 944 (USA)



Rapid diagnosis chart for universal test adapter (continued)

Test step	Switch position		But-ton	Remarks	Test specifica-tions (Reading)	for trouble-shooting see Coordinates
	V	Ω				
39	17	15	T5	Hold engine speed constant at 2000 min ⁻¹ . Press button T5. Injection signals stop and resume again at approx. 1000 min ⁻¹ .	Engine "hunts"	G 11
40	18	15		Vehicles as of 1.85: Check on/off ratio of idle-speed control term. 33 against term. 5.	Signal present (see diagram)	G 18
41	19	15		Vehicles as of 1.85: Check on/off ratio of idle-speed control term. 34 against term. 5.		G 15
42	20	22		Measure CO. Lambda closed-loop control "rich" stop. Term. 24 of control unit to ground.	CO rises to approx. 4...5 %. After approx. 10 s CO drops again.	G 17
43	20	23		Measure CO. Lambda closed-loop control "lean" stop. Term. 24 from control unit to + 2 V.	CO drops below 0.2 %. Engine runs rough.	G 19
44	20	24		Measure CO. Lambda closed-loop mode. Term. 24 from control unit connected to lambda sensor.	CO = <u>0.2 ... 0.6 %</u>	G 21



Signal at idle actuator

A15

Rapid diagnosis chart
Porsche 944 (USA)



A16

Rapid diagnosis chart
Porsche 944 (USA)



2. TEST SPECIFICATIONS

- Idle speed: 850...950 min⁻¹
Vehicles with idle-speed control as of 1.85: 800...880 min⁻¹
(jump term. B and C on test socket)
- Exhaust-gas setting:
CO concentration with engine at normal op. temp. intake-air temp. +15°... 0.4...0.8 vol.%CO.
+35°C; measure before catalytic converter, take lambda sensor connector apart.

C7

- Fuel pressure: 2.3...2.7 bar
- Fuel pump delivery: min. 850 cm³/30 s

- Injection valve
Electrical internal resistance: 2 ... 3 Ω

- Air-flow sensor
Resistance between term. 7 (2) and term. 6 (4): 8 Ω ... 1000 Ω
(deflect sensor flap)

Term. 9 (3) and term. 6 (4): 500 Ω ... 800 Ω

C5

- Idle actuator (in vehicles as of 1.85)
Electrical internal resistance at +20°C:

Term. 4 to term. 5 17 ... 19.5 Ω
Term. 4 to term. 3 19 ... 21.5 Ω

See equipment and Autodata microfiches for settings for valve clearance and other engine data.

A17

Test specifications
Porsche 944 (USA)



● Temperature sensor I (NTC I-Air):

Electrical internal re-
sistance at +15°C...+30°C 1.45...3.3 kΩ
measured at air-flow sensor
between term. 22 (1) and term.
6 (4) at +80°C: 280 ... 360 Ω

Temperature sensor II (NTC II-Engine):

Electrical internal re-
sistance at +15°C...+30°C: 1.45...3.3 kΩ
at +80°C: 280...360 Ω

C7

● Engine-speed sensor and reference-mark sensor

Electrical internal
resistance: 0.6...1.6 kΩ

C9

● Throttle-valve switch

Resistance of idle contact
(term. 2 and term. 43): 0 Ω

Full-load contact (term. 3
and term. 43): 0 Ω

C7

● Altitude sensor

Above 1000 m altitude
(contact closed): 0 Ω

Below 1000 m altitude
(contact open): ∞ Ω

C7

● Heating coil of lambda sensor:

approx. 6...20 Ω

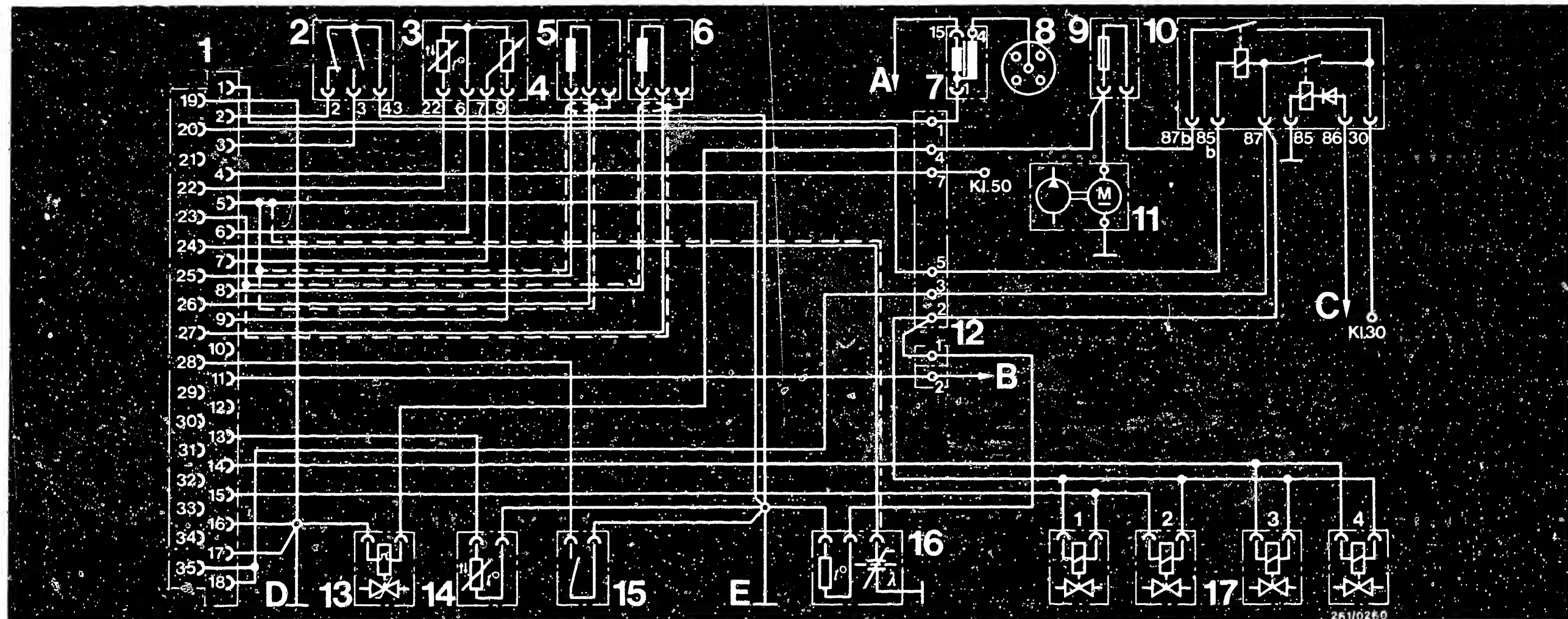
● Auxiliary-air device

Electrical internal
resistance

Vehicles up to 8.82: 30 ... 65 Ω

Vehicles from 8.82 to 1.85: 20 ... 55 Ω





3. ELECTRICAL TERMINAL DIAGRAM

3.1 For vehicles up to 1.85

1 = Motronic control-unit plug
 2 = Throttle-valve switch
 3 = NTC temperature sensor I (air)
 4 = Air-flow sensor
 5 = Reference-mark sensor
 6 = Engine-speed sensor
 7 = Ignition coil
 8 = High-voltage distributor
 9 = Auxiliary fuse box,
 fuse No. 2

10 = Pump and main relays
 (U in central-electrics box)
 11 = Fuel pump
 12 = Plug-in connector in engine
 compartment
 13 = Auxiliary-air device
 14 = NTC temperature sensor II (engine)
 15 = Altitude sensor
 16 = Lambda sensor, heated only for California
 17 = Injection valves (cyl. 1, 2, 3, 4)

A = To central-electrics box A 12
 B = To consumption indicator
 C = To central-electrics box
 D = Clutch housing ground
 E = Engine block ground

A19

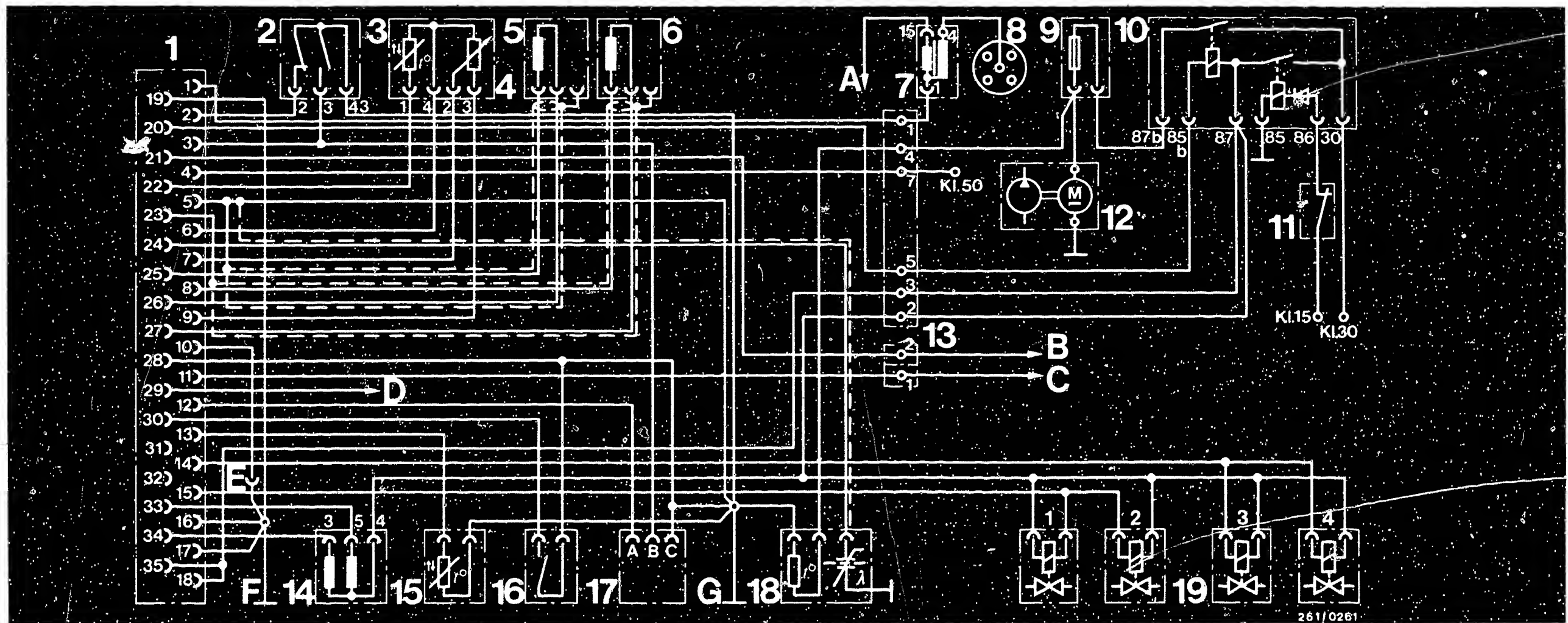
Electrical terminal diagram
 Porsche 944 (USA)



A20

Electrical terminal diagram
 Porsche 944 (USA)



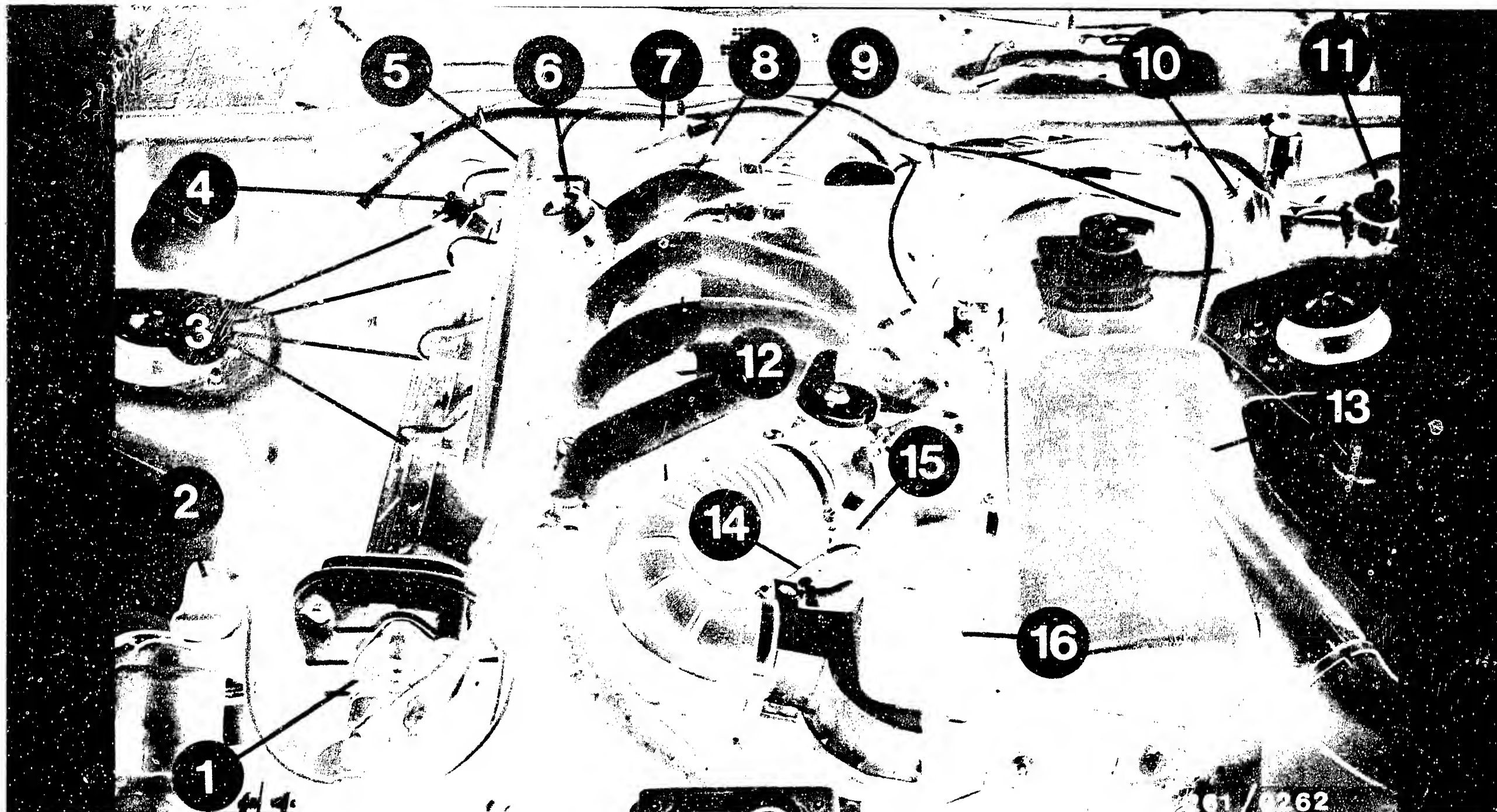


261/0261

3.2 Electrical terminal diagram (for vehicles as of 1.85)

- | | | |
|---|--|---|
| 1 = Motronic control-unit plug | 11 = Alarm system | A = To central-electrics box C 32 (term. 15) |
| 2 = Throttle-valve switch | 12 = Fuel pump | B = To tachometer |
| 3 = NTC temperature sensor I (air) | 13 = Plug-in connector in engine compartment | C = To consumption indicator |
| 4 = Air-flow sensor | 14 = Idle actuator | D = To air conditioner (B +) |
| 5 = Reference-mark sensor | 15 = NTC temperature sensor II (engine) | E = Map plug (connected for California and Japan version) |
| 6 = Engine-speed sensor | 16 = Altitude sensor | F = Clutch housing ground |
| 7 = Ignition coil | 17 = Test socket | G = Engine block ground |
| 8 = High-voltage distributor | 18 = Lambda sensor, heated | |
| 9 = Fuse No. 34 in central-electrics box | 19 = Injection valves (cyl. 1, 2, 3, 4) | |
| 10 = Pump and main relays (G5 in central-electrics box) | | |





INSTALLATION POSITION OF COMPONENTS

- 1 = High-voltage distributor
- 2 = Ignition coil
- 3 = Injection valves
- 4 = Pressure regulator
- 5 = Fuel-distribution pipe

- 6 = Fuel-line-pressure damper
- 7 = Plug-in connector for
lambda sensor
- 8 = Ground terminals for Motronic
- 9 = Engine-speed and reference-mark sensors
- 10 = Control valve 2

- 11 = Control valve 1
- 12 = Auxiliary-air device/idle
actuator
- 13 = Air filter
- 14 = Temperature sensor II (engine)
- 15 = Throttle-valve switch
- 16 = Air-flow sensor

B1

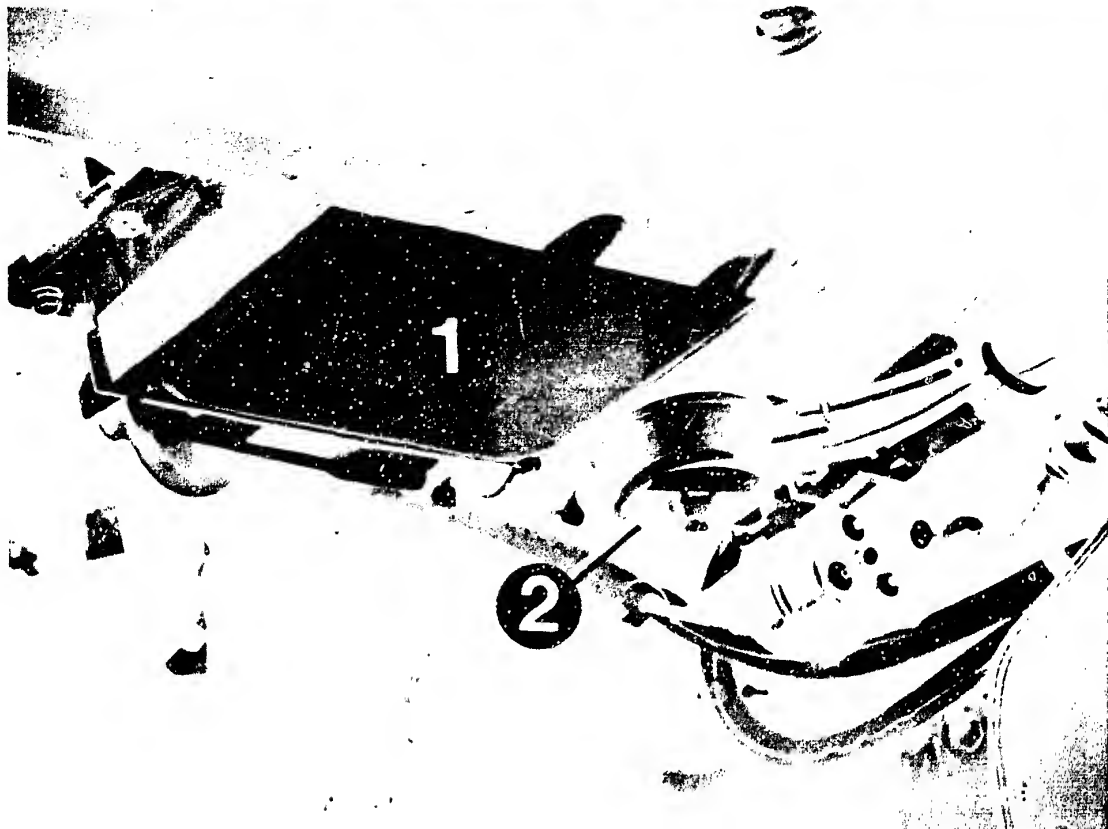
Installation position of components
Porsche 944 (USA)



B2

Installation position of components
Porsche 944 (USA)





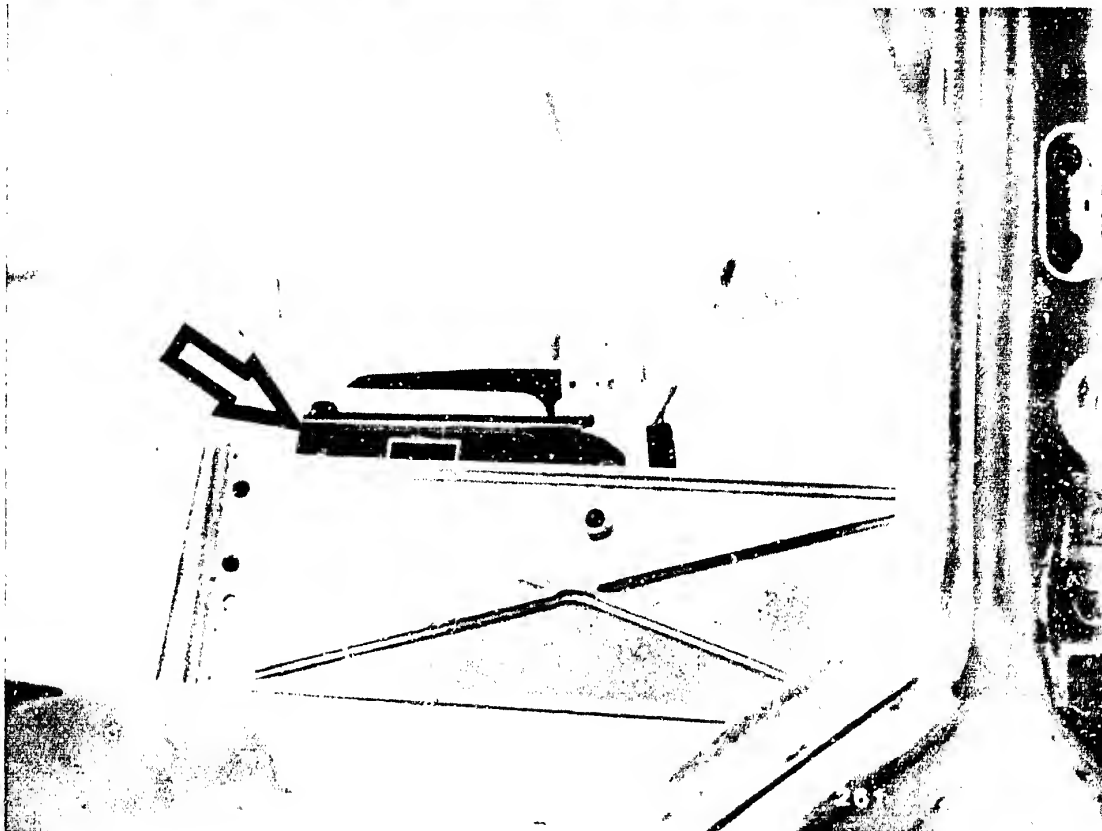
1 = Control unit
2 = Altitude sensor

Installation position of components (continued):

Control unit (up to 1.85): Below dashboard panel, in front of steering column

Altitude sensor (up to 1.85): Next to control unit, in front of steering column





Arrow = Control unit

Installation position of components (continued)

Control unit (as of 1.85): On front passenger side,
behind footwell cover.

Altitude sensor (as of 1.85): Behind glove compartment.

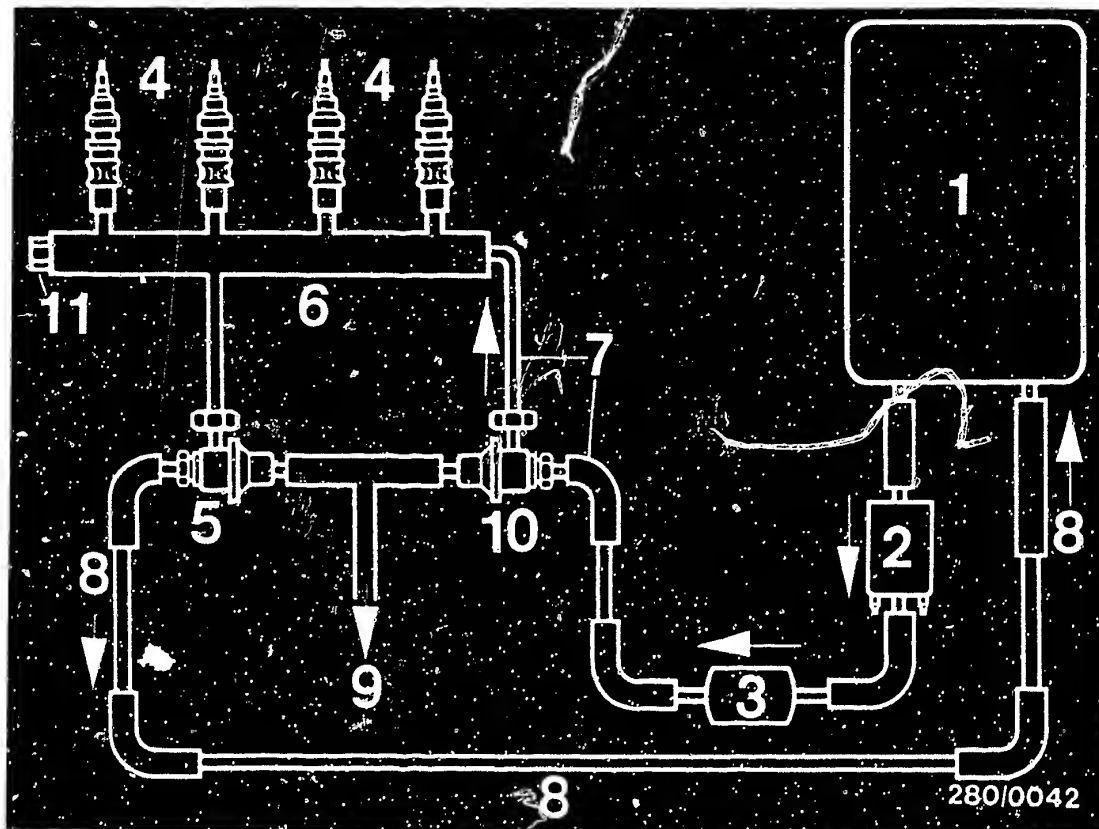


Installation position of components (continued)

The indications (right) and (left) always refer to the forward direction of travel.

Reference-mark and engine-speed sensors:	On crankcase flange below oil filler neck.
Relay 1 (fuel pump relay) combined with relay 2 (main relay):	In central-electrics box, up to 1.85 relay U, as of 1.85 relay G 5
Temperature sensor I:	In air-flow sensor
Temperature sensor II (engine):	On left-hand side of engine between cylinders 1 and 2. Blue plug.
Central ground:	On clutch housing, near engine-speed and reference-mark sensors.
Auxiliary-air device (up to 1.85)/idle actuator (as of 1.85):	Below intake distributor
Lambda sensor:	In common exhaust pipe before catalytic converter.
Thermo-switch +58°C (+130°F):	Below intake port on cylinder 4.





5. DIAGRAM OF FUEL LINES

- 1 = Fuel tank
- 2 = Electric fuel pump
- 3 = Fuel filter
- 4 = Solenoid-operated injection valves
- 5 = Pressure regulator
- 6 = Fuel-distribution pipe
- 7 = Fuel-delivery line
- 8 = Fuel return line
- 9 = to intake manifold
- 10 = Fuel-line-pressure damper
- 11 = Test connection



5.1 Tank ventilation system

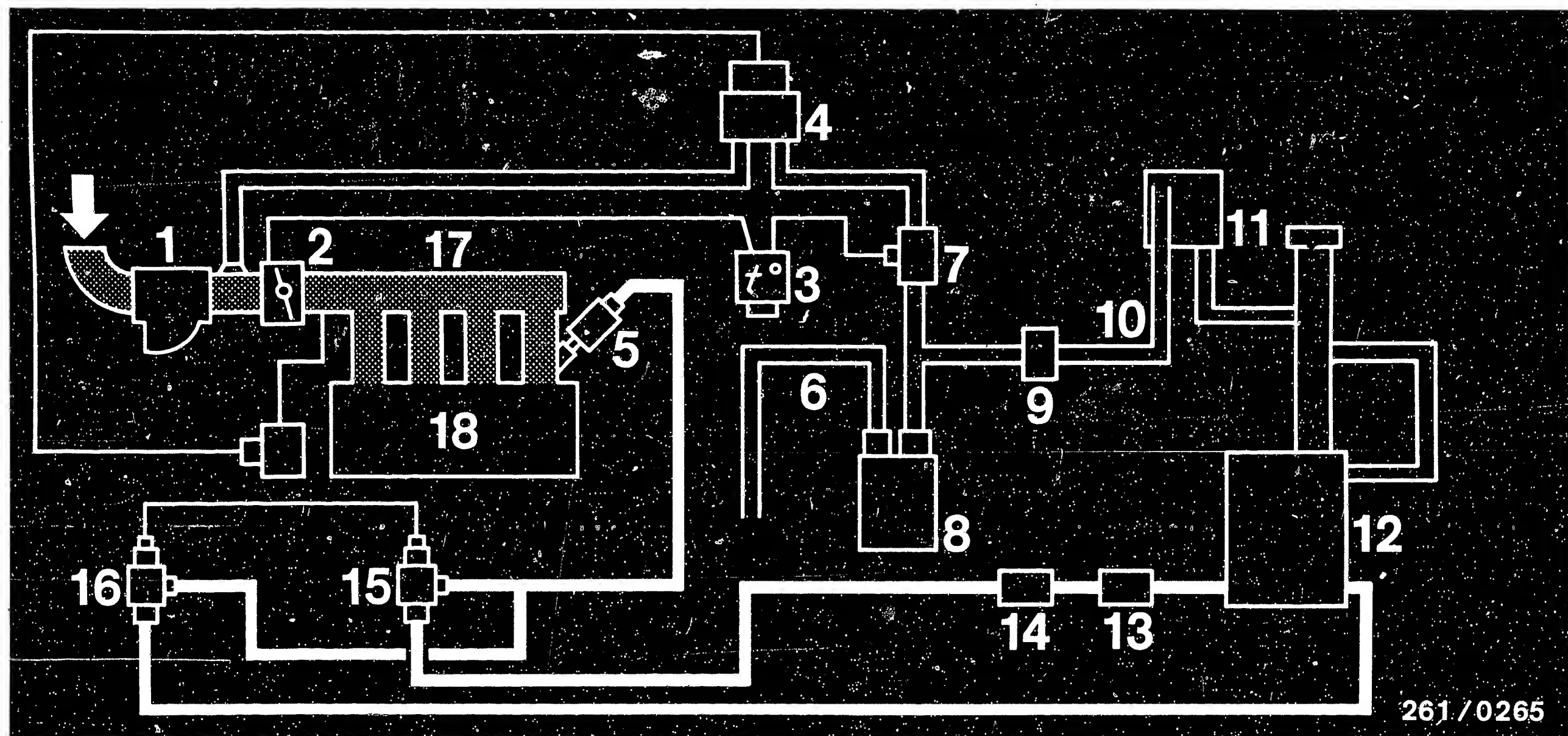
Active-carbon container for pollution-free tank ventilation

A law in the USA forbids the escape of hydrocarbon gases unfiltered into the atmosphere.

After the roll-over safety valve (9), the gases are discharged not into the atmosphere, but in a steel line under the vehicle floor toward the front to the engine compartment. With the engine stopped, the gases can get only to the active-carbon container in the left-hand wheelhouse, where they are filtered and cleaned.

After the engine is started, however, the hydrocarbon residues must be removed from the container. This is done by a ventilation line which ends in the intake system of the engine. If, however, the hydrocarbon gases were to be drawn in during the cold-running phase, this would lead to overenrichment of the air-fuel mixture, and the engine would buck, and possibly even stall. For this reason, 3 valves ensure that ventilation of the active-carbon filter can only begin after the engine has reached normal operating temperature.





Tank ventilation system (continued)

- 1 = Air-flow sensor
- 2 = Throttle-valve switch
- 3 = Thermo-valve +58°C (+130°F)
- 4 = Control valve
- 5 = Injection valve
- 6 = Scavenging-air line

- 7 = Switch-off valve
- 8 = Active-carbon filter
- 9 = Roll-over safety valve
- 10 = Ventilation line
- 11 = Expansion tank
- 12 = Fuel tank

- 13 = Electric fuel pump
- 14 = Fuel filter
- 15 = Fuel-line-pressure damper
- 16 = Pressure regulator
- 17 = Intake manifold
- 18 = Engine

B8

Diagram of fuel lines
Porsche 944 (USA)



B9

Diagram of fuel lines
Porsche 944 (USA)



- Thermo-valve

The thermo-valve (3) is open at engine-block temperatures above +58°C and establishes a vacuum connection between throttle valve and switch-off valve.

- Switch-off valve

The switch-off valve (7) is energized via the thermo-valve. The switch-off valve is open: At engine-block temperatures above +58°C and at least 1° deflection of the throttle valve.

- Control valve

A separate vacuum line is connected to the control valve (4). The vacuum line ends approx. 20 mm below the throttle valve so that changing pressure condi-tions in the intake manifold are transmitted directly to the control valve.

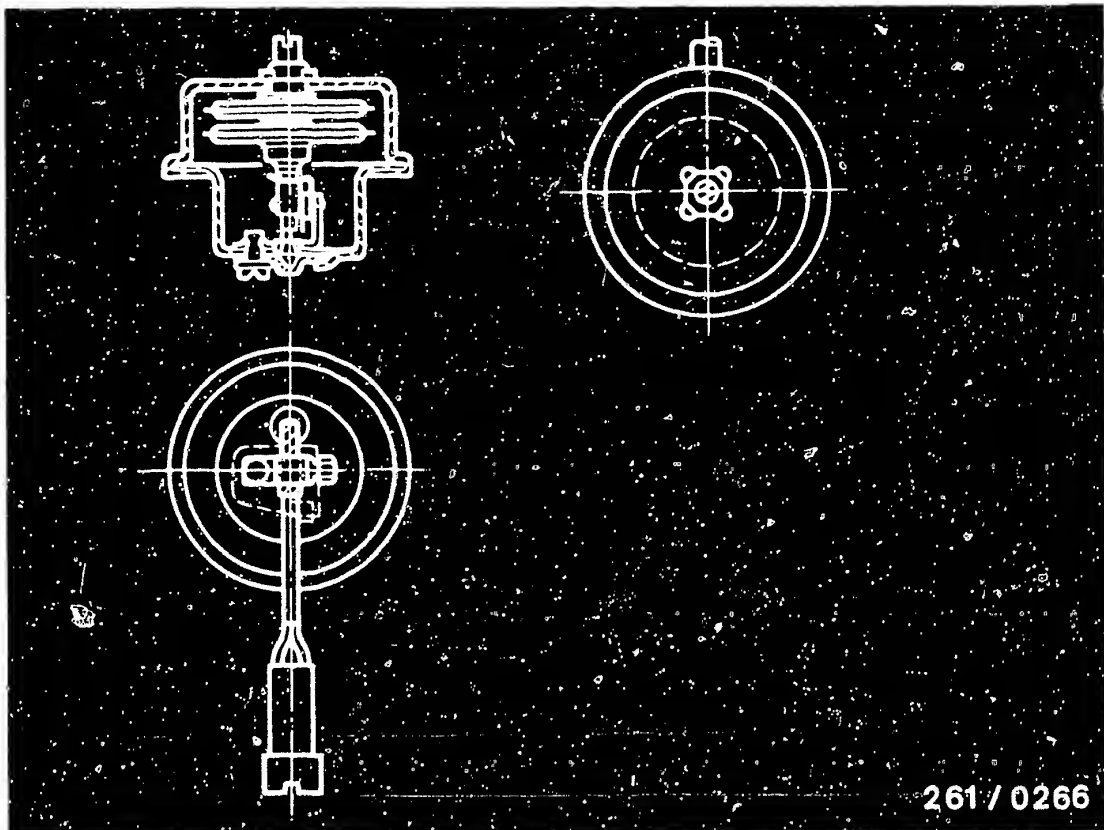
Throttle valve wide open	-	Control valve wide open
Throttle half open	-	Control valve partially open
Throttle valve closed	-	Control valve almost closed

Since all three valve are connected in "series", the active-carbon container can only be evacuated (and the air-fuel mixture influenced) if:

- the engine temperature is above +58°C and the
- throttle valve is deflected by at least 1°.

The further the throttle valve is opened, the more the active-carbon filter is evacuated and ventilated.





6. OPERATION OF ALTITUDE SENSOR

A housing contains 2 barometric cells which close a contact at $P_{aps} = 900 \pm 20$ mbar (approx. 1000 m altitude). The barometric cells are surrounded by atmospheric pressure. Above approx. 1000 m altitude the contact closes and the duration of injection is shortened by 6% if the engine is at normal operating temperature and is being operated in the part-load range. In this way, the altitude sensor compensates for the physically determined enrichment of the air-flow sensor. The mixture composition remains more or less constant.

B 13

Altitude sensor
Porsche 944 (USA)



7. TEST EQUIPMENT AND TOOLS

Description	Designation	Part No.
Universal test adapter Adapter lead for vehicles with lambda closed-loop control	ETT 018.01	0 684 101 801 1 684 463 128
Motortester	e.g. MOT 201 or MOT 300 and MOT 400	0 684 000 201 0 684 000 300 0 684 000 400
Diagnostic cable for spark-advance measure- ment		1 684 463 095
Exhaust-gas analyzer	e.g. ETT 008.0 or ETT 008.0	0 684 100 80 0 684 100 80
Multimeter (internal resistance min. 20 k Ω /V)		commercially available e.g. Metra- watt GmbH type MA 2 H or Fluke Multime- ter 75 or 77
Pressure gauge 6 bar or pressure tester or pressure tester (no longer avail- able) Three-way line as connecting part for KDJE-P 100 and KDEP 1034	Quality class 1.0 0.1 bar gradua- tion	1 687 231 154 KDJE-P 100 KDEP 1034 KDJE-P 100/13



<u>Description</u>	<u>Part No.</u>
Feeler gauge for measuring the sensor air gaps (up to 1 mm)	commercially available
Lubricant for engine-speed and reference- mark sensors	Molykote Longterm 2, commercially available
Chassis dynamometer e.g. LPS 96 or LPS 002	0 680 017 001 0 680 100 200
Electrical connecting lead (Test lead) for direct connection of components under test (e.g. injection valves).	KDJE 7450/70

Tool set for removing and fitting the idle CO anti-
tamper device on the air-flow sensor, e.g. No. 13 1090
from

Cartool
Hans Schubert KG
Unterer Grasweg 88
D - 8070 Ingoldstadt

or from BMW of America

Mounting paste VS 14016 Ft for Lambda sensor and exhaust- gas screw plug	5 964 080 105
Hose clammer for pinching off fuel and air hoses	commercially available
Exhaust-gas test pipe	Porsche No. US 8023 or SUN 120-239



8. IMPORTANT GENERAL INFORMATION

Be sure to follow these instructions in order to prevent damage to the engine, the control unit or the ignition coil, as well as to prevent danger to persons.

- Never start engine without securely connected battery.
- Incorrect polarity of supply voltage, e.g. through incorrect connection of battery or ignition coil, can lead to destruction of control unit.
- Do not use a fast charger for starting the engine.
Starting assistance only with second 12 V battery and jump leads.

Caution:

Because of non-standardized requirements of vehicle manufacturers for electronic products, we recommend not using a 24 V battery for starting assistance. Follow vehicle owner manual.

- Disconnect the battery from the vehicle electrical system before fast charging.
- If charging the battery in the vehicle or if rendering starting assistance, follow the instructions in the operating instructions of the fast charger as well as the instructions of the vehicle manufacturer.
- Never disconnect the battery from the vehicle electrical system with the engine running.
- Do not short-circuit ignition coil term. 1 to ground (e.g. for stopping the engine). Ignition coil and possibly control unit will be destroyed.



- Never connect the positive pole of the battery to ignition coil term. 1. Control unit will be destroyed.
- Never connect or disconnect wiring-harness plug of control unit with ignition on.
- At temperatures above +80°C (paint-drying installation) remove the control unit.
- Remove the control unit before performing welding work (electrical spot welding).
- When testing compression, disconnect the relay set. This prevents undesired injecting through the injection valves.
- If an alarm system is installed, observe the information in the installation instructions for Motronic vehicles or after-sales service instructions SIS-A11-500.

It must be guaranteed that the alarm relay is not disturbed by extraneous sources (e.g. by ignition cables), thus causing the alarm relay to trip incorrectly.

C A U T I O N !

High-energy ignition system,
dangerous voltages on primary
and secondary sides.



This means the following:

The Motronic contains a high-energy ignition system which can be extremely dangerous if live parts or terminals are touched (both on the primary as well as on the secondary side).

In this connection, we should like to point out that, when working on or testing the ignition system, you should observe the VDE regulations, particularly VDE 0104/7.67.

Always switch off the ignition (switch off ignition/voltage source) when working on the ignition coil.

Such work includes:

Connecting of engine test equipment (timing light, dwell-tach tester, ignition oscilloscope etc.).

Replacing of parts of the ignition system (spark plug, ignition coil, high-voltage distributor, ignition cable etc.).

If, when testing the ignition system or performing adjustment operations on the engine, it becomes necessary to switch on the ignition (switch on ignition/voltage source), the aforementioned dangerous voltages occur over the entire system.

The danger of accident exists, therefore, not only on the individual components of the ignition system (such as high-voltage distributor, ignition coil, control unit and ignition harness), but also on the wiring harness (e.g. tachometer connection, diagnostic plug), at plug-in connections and on test equipment.



9. TROUBLE-SHOOTING

Using the universal test adapter and other suitable testers, the following trouble-shooting programs are intended to enable the workshop employees to quickly detect causes of trouble on the Motronic.

Depending on the level of training and experience of the workshop employee, a choice can be made between the following working procedures.

- detailed, step-by-step trouble-shooting: for employees with little practice or experience on Motronic vehicles
- pin-pointed, direct trouble-shooting: for experienced employees with a great deal of practice on Motronic vehicles.

C3

C5

Both trouble-shooting programs begin by checking the electrical/electronic part of the Motronic with the aid of the universal test adapter ETT 018.01.

With this, the wiring harness with the components connected to it (including control unit) are quickly checked for proper electrical operation and faults are rapidly detected.

If no fault is found with the universal test adapter, it is necessary to continue with the detailed or direct trouble-shooting program.

C1

Trouble-shooting
Porsche 944 (USA)



C2

Trouble-shooting
Porsche 944 (USA)



9.1 Detailed, step-by-step trouble-shooting

9.1.1 Test with universal test adapter

This test must come at the beginning of the testing program and must be performed from beginning to end.

9.1.2 Trouble-shooting according to customer complaints (fault symptoms)

The table below contains possible fault symptoms and the column on the right gives the first coordinate of the respective detailed trouble-shooting program.

The trouble-shooting program consists of logically ordered test procedures for all Motronic components.

If, after completing the trouble-shooting program for an assumed symptom, the fault has not been detected or remedied, choose a new fault symptom and work through another program.

<u>Customer complaints (fault symptoms)</u>	<u>Test with universal test adapter</u>	<u>Coordinates</u>
1. Engine fails to start or starts only with great difficulty	C 11	H 1
2. Engine starts but then dies	C 11	H 15
3. Rough engine idle	C 11	J 1
4. Poor throttle take-up	C 11	K 1
5. Engine missing under all operating conditions	C 11	K 11
6. Fuel consumption too high	C 11	L 1
7. Maximum engine power/top speed not reached	C 11	L 7
8. CO concentration at idle too high or too low	C 11	M 1

C3

Trouble-shooting
Porsche 944 (USA)

**C4**

Trouble-shooting
Porsche 944 (USA)



9.2 Pin-pointed, direct trouble-shooting

9.2.1 Test with universal test adapter

The test with the universal test adapter must come at the beginning of the testing program and must be performed from beginning to end.

9.2.2 Trouble-shooting according to customer complaints

The table below contains various fault symptoms with several possible causes of the trouble in each case. The coordinate reference panel indicates the first coordinate of the testing procedure for the respective Motronic component.

If, after testing the individual components, the fault has not been detected or remedied, choose a new fault symptom.

Customer complaints (fault symptoms)

1. Engine fails to start or starts only with great difficulty								
2. Engine starts but then dies								
3. Rough idle/incorrect idle speed								
4. Poor throttle take-up								
5. Engine missing under all operating conditions								
6. Fuel consumption too high								
7. Maximum engine power/top speed not reached								
8. CO concentration at idle too high or too low								
<u>Cause</u> (component fault)								
C 11	C11	C11	C11	C11	C11	C11	C11	Test with universal test adapter
●*)								Relay set (main relay and pump relay) defective
●*)								Electric fuel pump not operating
H7	H19	J7	K7					Auxiliary-air device (up to 12.84)/idle actuator (as of 1.85)
		●*)						Throttle-valve switch (idle contact) needs adjusting/defective
H11	H23	J3	K5	K19	L5	L13	M3	Air-flow sensor defective

C5

Trouble-shooting
Porsche 944 (USA)

**C6**

Trouble-shooting
Porsche 944 (USA)



Customer complaints (fault symptoms)

1. Engine fails to start or starts only with great difficulty

2. Engine starts but then dies

3. Rough idle/incorrect idle speed

4. Poor throttle take-up

5. Engine missing under all operating conditions

6. Fuel consumption too high

7. Maximum engine power/top speed not reached

8. CO concentration at idle too high or too low

Cause (component fault)

H11	H17	J5	K5				M5	Intake system leaking
H3		J11						Solenoid-operated injection valves defective
●*)		●*)				L11		Fuel pressure too low or zero, pressure regulator not operating
		●*)			●*)		●*)	Fuel pressure too high, pressure regulator not operating
				K15		L15		Fuel delivery too low
	●*)				●*)		●*)	Temperature sensor I (air) or temperature sensor II (coolant) defective
						L9		Throttle valve not opening fully
				K13				Poor central ground, loose contacts, faulty plug-in connections
H11	H17	J5	K5			L19	M5	Open circuit in wiring harness and plug-in connections
						●*)		Throttle-valve switch (full-load contact) defective
		J13					M7	CO exhaust-gas setting too rich, idle adjustment
		J13	●*)				M7	CO exhaust-gas setting too lean, idle adjustment
		●*)	●*)		●*)		●*)	Altitude sensor defective

C7

Trouble-shooting
Porsche 944 (USA)



C8

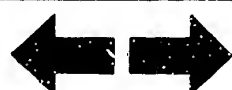
Trouble-shooting
Porsche 944 (USA)



Customer complaints (fault symptoms)

1. Engine fails to start or starts only with great difficulty							
2. Engine starts but then dies							
3. Rough idle/incorrect idle speed							
4. Poor throttle take-up							
5. Engine missing under all operating conditions							
6. Fuel consumption too high							
7. Maximum engine power/top speed not reached							
8. CO concentration at idle too high or too low							
Cause (component fault)							
●*)							Engine-speed sensor defective
●*)							Reference-mark sensor defective
			K21				Check alternator, interference-suppression devices
H3	J3	K3	K13	L3	L9	M3	Check secondary patterns
●*)	●*)	●*)	●*)	●*)	●*)	●*)	Control unit defective
	●*)					●*)	Lambda closed-loop control defective

●*) This component has already been tested if you have already performed the test with the universal test adapter. Continue testing with the next component in this column.
 If, however, you have arrived at this point by way of a component complaint or the test-specifications table, you must now test this component with the universal test adapter.
 The testing program for the universal test adapter starts on Coordinate C11 and must be performed from beginning to end.



10. TEST WITH UNIVERSAL TEST ADAPTER

ETT 018.01 (0 684 101 801) and adapter lead for
Motronic with lambda closed-loop control

Connect universal test adapter to Motronic wiring harness (ignition must be off).

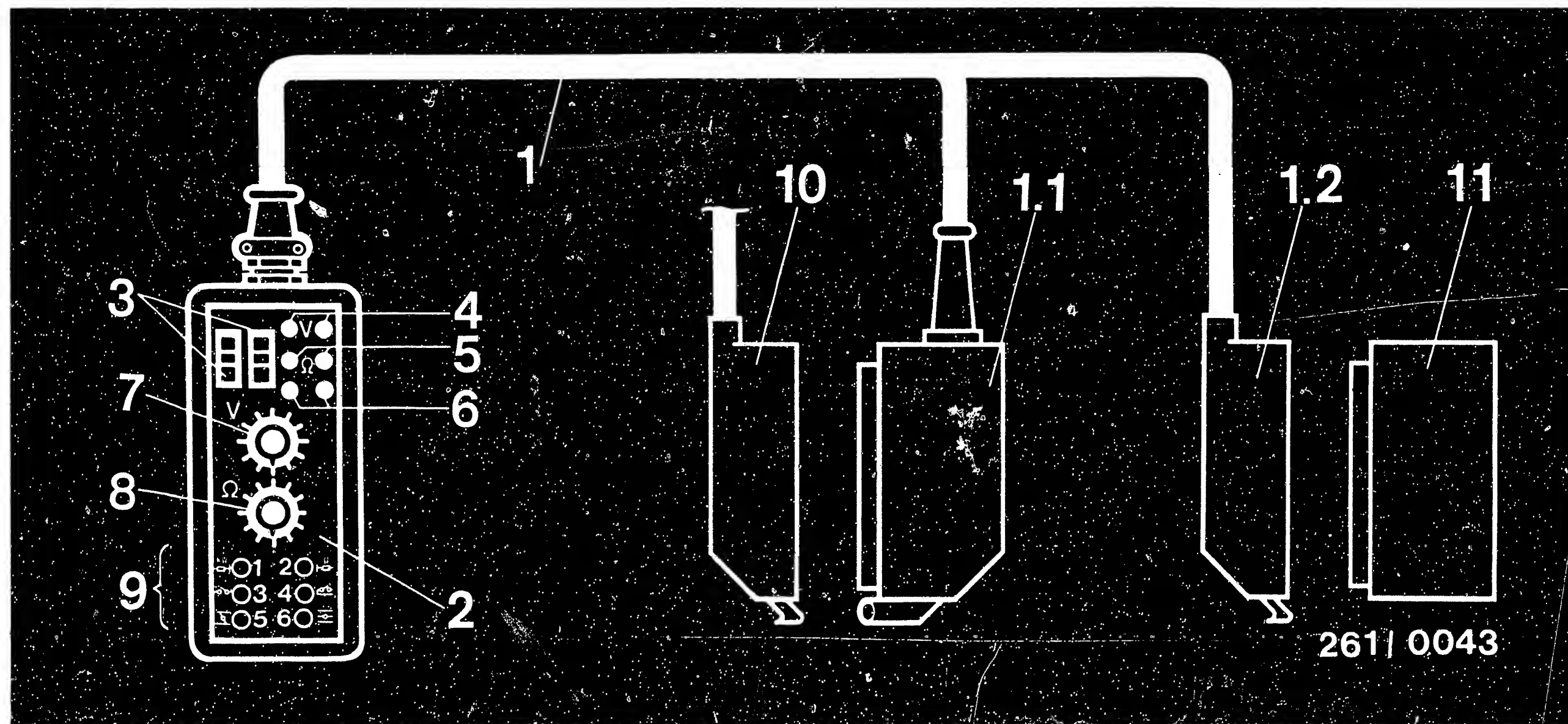
To test the wiring harness and the components connected to it, only the Motronic wiring harness may be connected, but not the control unit. Be sure to follow the instructions in the test chart.

To take the measurements, connect a measuring instrument for voltage and resistance (multimeter) as well as the motortester to the test adapter.

The individual test steps are selected with the program switch. The symbols "V" and " Ω " show the operator whether voltage or resistance is being measured. Some switch settings are also required for simulation with the engine running. By pressing the buttons, it is possible with the control unit connected and the engine running to simulate operating conditions. Thus, for example, with the engine at normal operating temperature, it is possible by pressing button T1 to make the control unit think that the engine temperature is -20°C . The reaction of the control unit can then be evaluated on the motortester.

If necessary, the circuit diagram can be used for trouble-shooting.





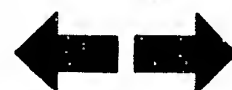
Universal test adapter with adapter lead for Motronic

- 1 = Adapter lead
- 1.1 = Connection to wiring harness
- 1.2 = Connection to control unit
- 2. = Universal test adapter (Part No. 0 684 101 801)
- 3 = Test well (for motortester)
- 4 = Test sockets (for voltage measurement)
- 5 = Test sockets (for resistance measurement)
- 6 = Test sockets (not assigned)
- 7 = Program switch "V"
- 8 = Program switch "Ω"

- 9 = Button panel for simulation of operating conditions
- 10 = Motronic wiring harness
- 11 = Control unit
- Button 1 = NTC II (engine), cold (-20°C)
- Button 2 = NTC II (engine), warm (+80°C)
- Button 3 = Pump energization
- Button 4 = not assigned
- Button 5 = Throttle-valve idle contact
- Button 6 = Throttle-valve full-load contact

C12

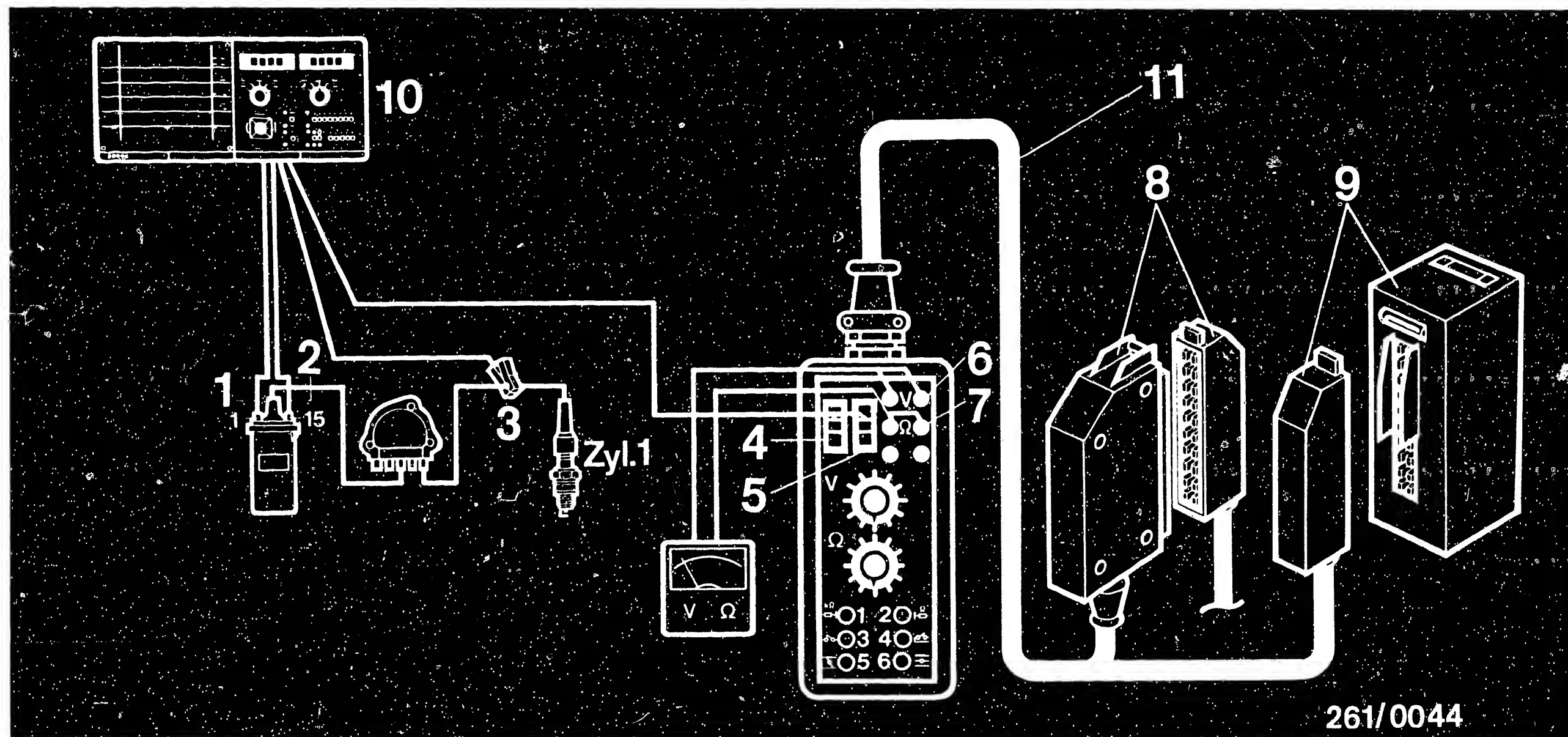
Test with universal test adapter
Porsche 944 (USA)



C13

Test with universal test adapter
Porsche 944 (USA)





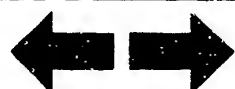
Connection diagram for universal test adapter

- 1 = Green clip to ignition coil term. 1
- 2 = Yellow clip to ignition coil term. 15
- 3 = Induction-type clamp-on pickup over ignition cable of cylinder 1
- 4 = Red connection socket (test well) for red clamp of motortester
- 5 = Black connection socket (test well) for black clamp of motortester

- 6 = Connection of voltmeter at V-sockets (red = +, black = ground/negative)
- 7 = Connection of ohmmeter at Ω-sockets (blue)
- 8 = Connection to Motronic wiring harness
- 9 = Connection to Motronic control unit
- 10 = Motortester
- 11 = Adapter lead for Motronic with lambda-closed loop control

C14

Test with universal test adapter
Porsche 944 (USA)



C15

Test with universal test adapter
Porsche 944 (USA)



Preparations for testing with the universal test adapter

1. Remove control unit and connect test adapter

Installation position of control unit up to 1.85: Under dashboard panel in front of steering column.
as of 1.85: In front-passenger footwell behind footwell cover.

To remove the control unit, press the detent to the rear and hinge up the plug in the direction of the arrow and unhook.

The control unit is secured with 4 screws.

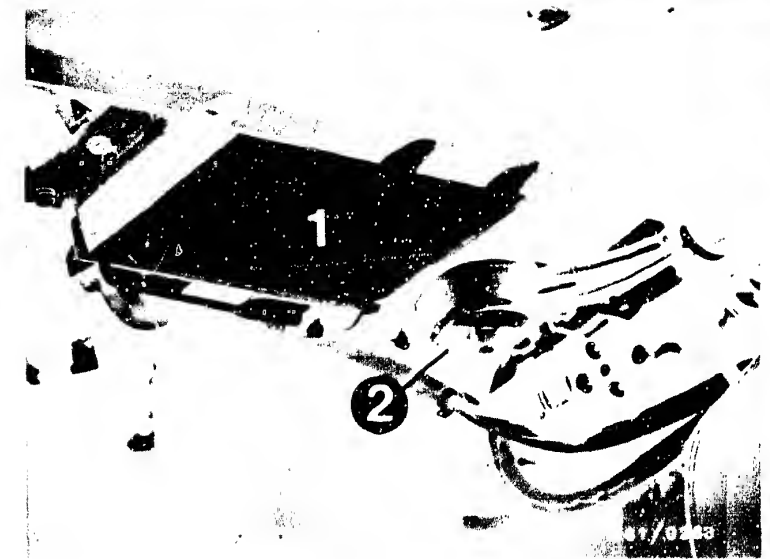
2. Disconnect pump fuse

Up to 1.85: Fuse No. 2 in auxiliary fuse box.
As of 1.85: Fuse G5 in central-electrics box.

To prevent confusion between the control units of the various systems, a mechanical encoding system has been introduced. The "lug" (pivot point when opening and connecting the control unit) and the corresponding mount on the control have mating recesses and pins.

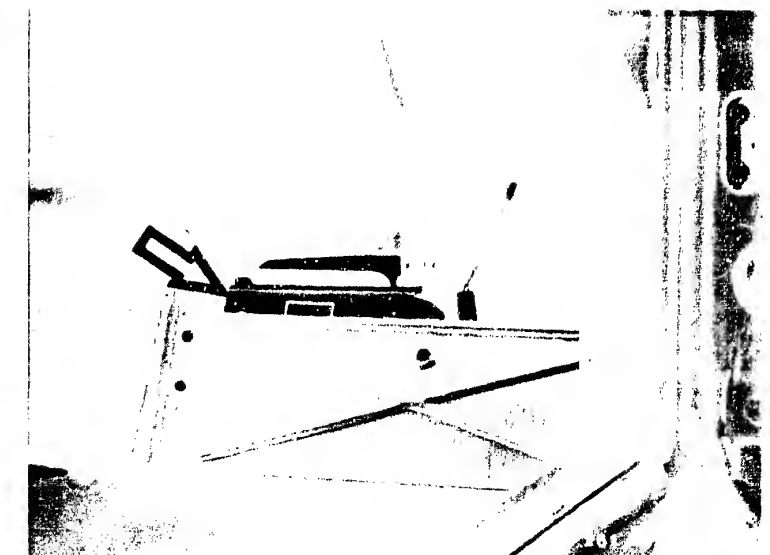
Note:

In the following test steps a white border in the "Operation" column indicates which operation has to be changed as compared to the preceding test step.



up to 1.85:
1=Control unit
2=Altitude sensor

as of 1.85:
Arrow=Control unit



C16

Test with universal test adapter
Porsche 944 (USA)

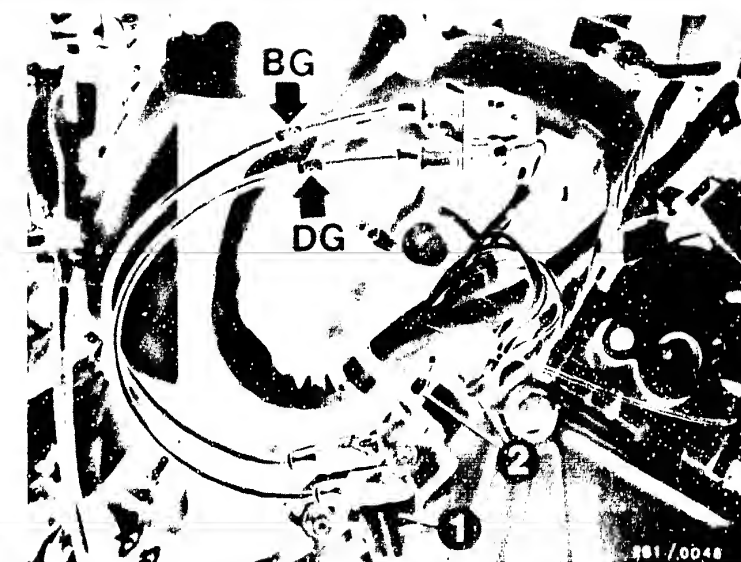


C17

Test with universal test adapter
Porsche 944 (USA)



TEST STEP 1: Switch off ignition. Disconnect control unit and pump fuse			
Operation		Reading	Testing
Program switch position "V"	↓	greater than 1 M Ω	Component: Engine-speed sensor
Program switch position "Ω"	1		
Measuring equipment: Ohmmeter			Operation: Insulation from term. 8 to ground
Measuring range: 10 M Ω			
Connection: Test sockets	Ω		Malfunction: Resistance less than 1 M Ω
Operation in vehicle: Switch off ignition			

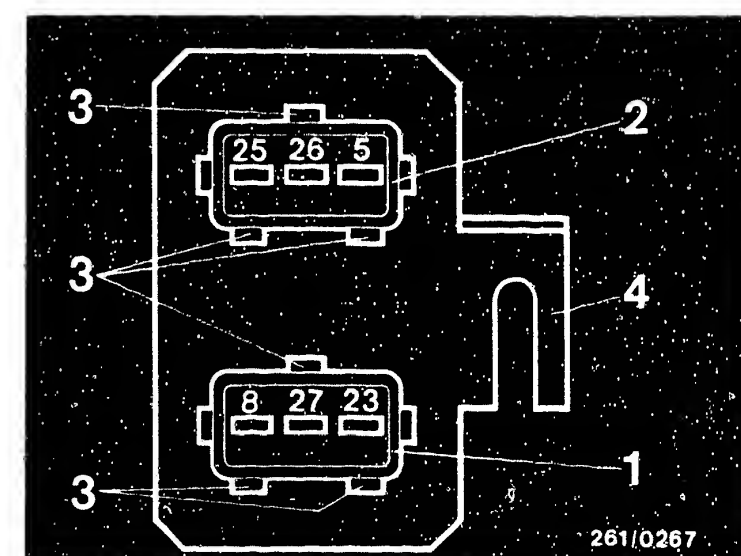


BG=Reference-mark sensor
 DG=Engine-speed sensor
 1=Holder
 2=Ground terminals for Motronic
 1=Plug connector for engine-speed sensor marked DG
 2=Plug connector for reference-mark sensor marked BG
 3=Locating lip
 4=Holding plate

Trouble-shooting:

Check plug-in connection for corrosion and insulation damage.
 Take apart plug-in connection and, using a wire, jump terminals 8 and 27 on the plug leading to the test adapter.
 Repeat test: If reading now O.K., replace engine-speed sensor. If reading still below test specification, there is insulation damage on the leads from control-unit plug term. 8 or term. 27 to the plug (e.g. short circuit to ground due to worn spot).

Continued on C20/C21



C18

Test with universal test adapter
Porsche 944 (USA)



C19

Test with universal test adapter
Porsche 944 (USA)



Trouble-shooting - TEST STEP 1 (continued)

● Replacing the sensor.

To replace the sensor, unscrew the hexagon-socket-head cap screw on the sensor. Remove dirt deposits from the sensor. If necessary, apply two screwdrivers to the recesses to left and right of the sensor and raise the sensor.

Before installing the sensor, make sure that no metal parts are sticking to it (sensor contains permanent magnet). Grease sensor with "Molykote Longterm 2".

Do not mix up sensors when installing.

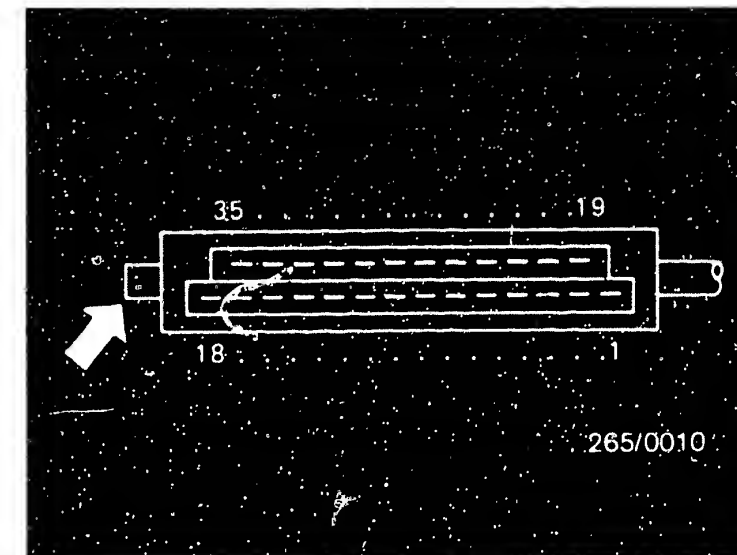
Pay attention to markings:

- Reference-mark sensor marked BG (on holder B).
- Engine-speed sensor marked DG (on holder D).

The sensors are plugged into their bores as far as they will go and are screwed down. Do not use force when inserting.

When mounting, make sure that the plug connectors are correctly assigned.

Pay attention to the correct seating and latching of the spring contacts in the plug. Spring contacts must not allow themselves to be pushed back.



Top view of control-unit plug (35-pin) with terminal numbers. Arrow="Lug" with mechanical encoding

- 1=Ground terminals for Motronic
- 2=Reference-mark sensor (B)
- 3=Engine-speed sensor (D)
- 4=Holder



C20

Test with universal test adapter
Porsche 944 (USA)



C21

Test with universal test adapter
Porsche 944 (USA)

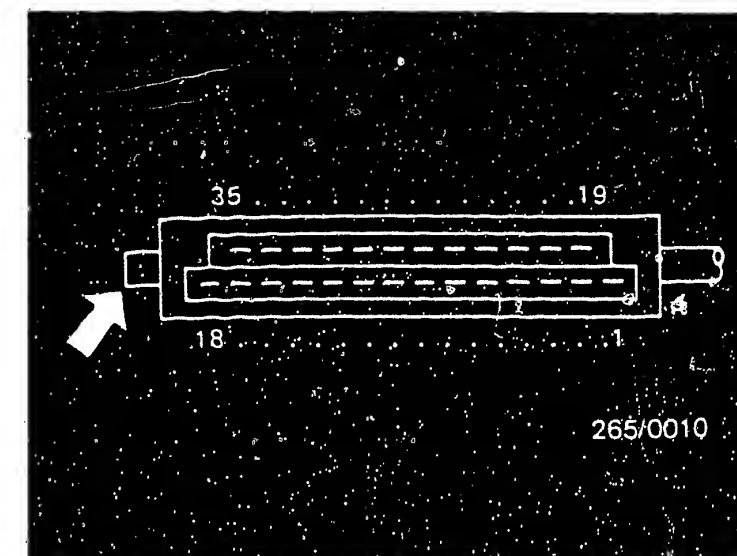


TEST STEP 2		
Operation	Reading	Testing
Program switch position "V"	↓	Component: Reference-mark sensor
Program switch position "Ω"	2	
Measuring equipment:	<div>yes</div> <div>↓</div> <div>Continue testing with next test step</div> <div>no</div> <div>↓</div>	Operation: Insulation from term. 25 to ground Malfunction: Resistance less than 1 MΩ
Ohmmeter		
Measuring range:		
10 MΩ		
Connection: Test sockets Ω		
Operation in vehicle: Switch off ignition		

Trouble-shooting:

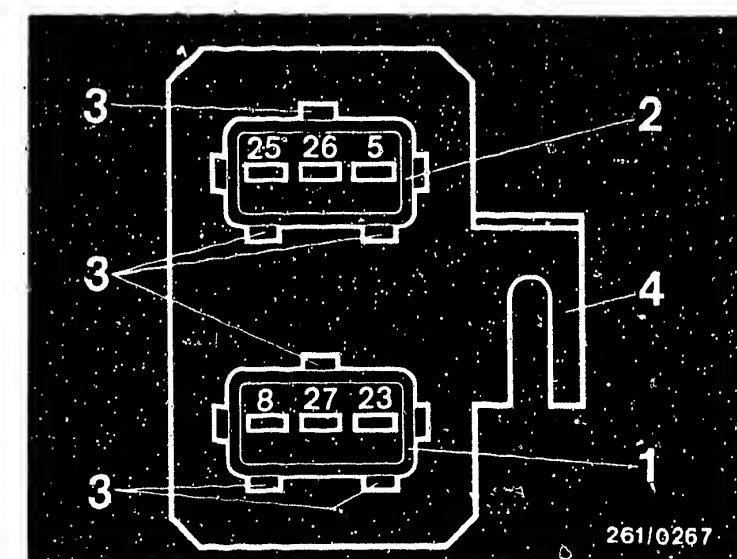
Check plug-in connection for corrosion and insulation damage.
 Take apart plug-in connection and, using a wire, jump terminals 25 and 26 on the plug leading to the test adapter.
 Repeat test: If reading now O.K., replace engine-speed sensor. If reading still below test specification, there is insulation damage on the leads from control-unit plug term. 25 or term. 26 to the plug (e.g. short circuit to ground due to worn spot).

Continued on D1/D2



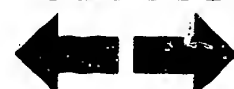
Top view of control-unit plug (35-pin) with terminal numbers.
 Arrow="Lug" with mechanical encoding

- 1=Plug connector for engine-speed sensor
- 2=Plug connector for reference-mark sensor with marking
- 3=Locating lip
- 4=Holding plate



C22

Test with universal test adapter
 Porsche 944 (USA)



C23

Test with universal test adapter
 Porsche 944 (USA)



Trouble-shooting - TEST STEP 2 (continued)

• Replacing the sensor.

To replace the sensor, unscrew the hexagon-socket-head cap screw on the sensor. Remove dirt deposits from the sensor. If necessary, apply two screwdrivers to the recesses to left and right of the sensor and raise the sensor.

Before installing the sensor, make sure that no metal parts are sticking to it (sensor contains permanent magnet). Grease sensor with "Molykote Longterm 2".

Do not mix up sensors when installing.

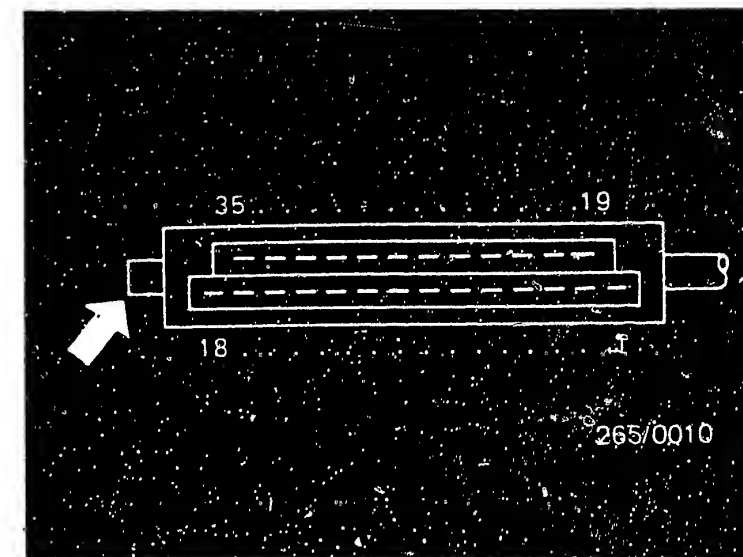
Pay attention to markings:

- Reference-mark sensor marked BG (on holder B).
- Engine-speed sensor marked DG (on holder D).

The sensors are plugged into their bores as far as they will go and are screwed down. Do not use force when inserting.

When mounting, make sure that the plug connectors are correctly assigned.

Pay attention to the correct seating and latching of the spring contacts in the plug. Spring contacts must not allow themselves to be pushed back.



Top view of control-unit plug (35-pin) with terminal numbers. Arrow="Lug" with mechanical encoding

1=Ground terminals for Motronic
2=Reference-mark sensor (B)
3=Engine-speed sensor (D)
4=Holder



D1

Test with universal test adapter
Porsche 944 (USA)



D2

Test with universal test adapter
Porsche 944 (USA)



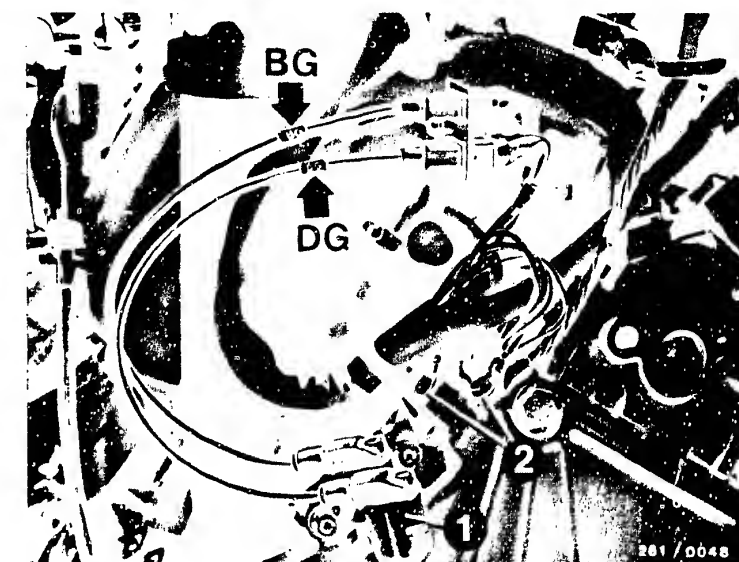
TEST STEP 3				
Operation		Reading	Testing	
Program switch position "V"	↓	0.6 ... 1.6 k Ω	Component: Engine-speed sensor	
Program switch position "Ω"	3	<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> yes ↓ Continue testing with next test step </div> <div style="text-align: center;"> no ↓ </div> </div>	Operation: Winding resistance between term. 8 and term. 27	
Measuring equipment: Ohmmeter			Malfunction: Resistance not within tolerance	
Measuring range: 0 to 10 k Ω				
Connection: Test sockets	Ω			
Operation in vehicle: Switch off ignition				

Trouble-shooting:

- Repeat measurement directly at sensor plug.
- Check plug-in connection: Corrosion, loose contact, (spring contacts must not allow themselves to be pushed back).
- Check leads from engine-speed sensor term. 8 and term. 27 to control-unit plug term. 8 and term. 27.
- Replace the sensor.

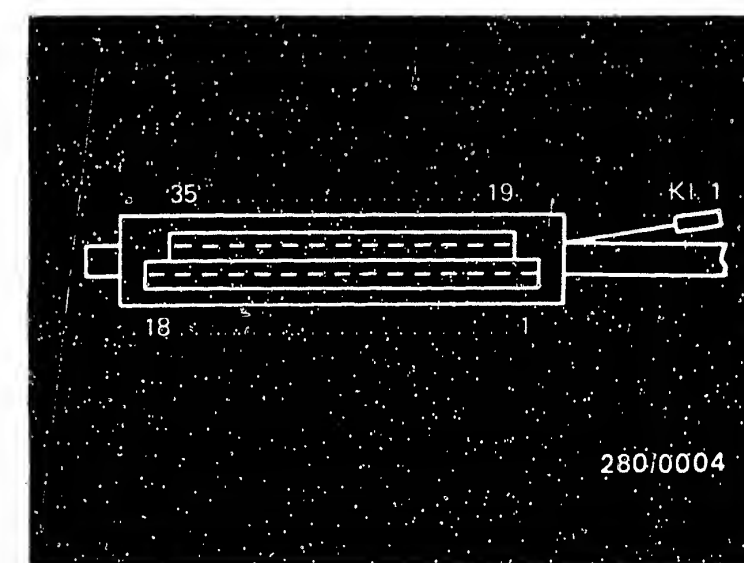
To replace the sensor, take apart the plug-in connection and unscrew hexagon-socket-head cap screw on sensor. Remove dirt deposits from sensor. If necessary, apply two screwdrivers to the recesses to left and right of the sensor and raise the sensor.
Caution: Do not loosen the holder.

Continued on D5



BG=Reference-mark sensor
 DG=Engine-speed sensor
 1=Holder
 2=Ground terminal for Motronic

Top view of control-unit plug (35-pin) with terminal numbers
 K1. 1=Plug-in connection to tachometer



280/0004

D3

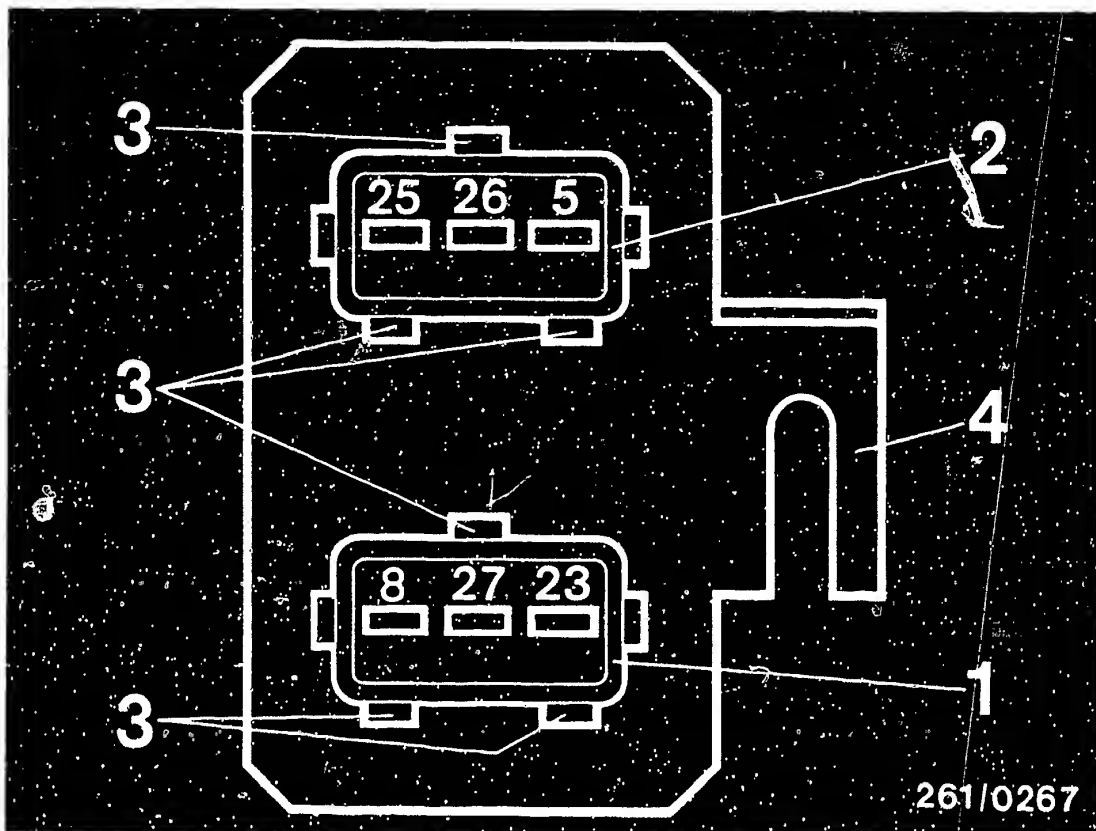
Test with universal test adapter
 Porsche 944 (USA)



D4

Test with universal test adapter
 Porsche 944 (USA)





Trouble-shooting-Test step 3 (continued)

Top view of plug connectors to sensors

- 1 = Connector of engine-speed sensor marked DG
- 2 = Connector of reference-mark sensor marked BG
- 3 = "Lugs" as locating lips
- 4 = Holding plate for sensor plug connectors
- 5,25,26,23,8,27 = Terminal numbers

Continued on D6/D7

D5

Test with universal test adapter
Porsche 944 (USA)



Trouble-shooting - Test step 3 (continued)

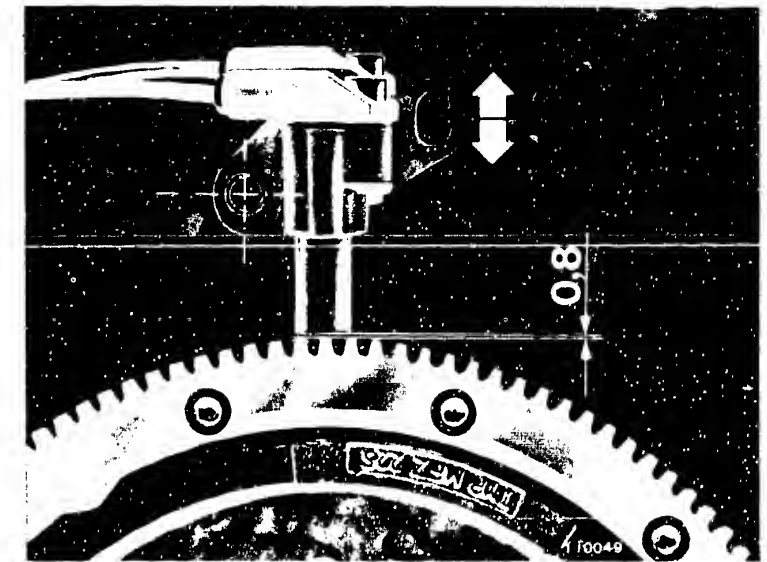
Before installing the sensor, make sure that no metal parts are sticking to it (sensor contains permanent magnet). Grease sensor with "Molykote Longterm 2".

Do not mix up sensors when installing.

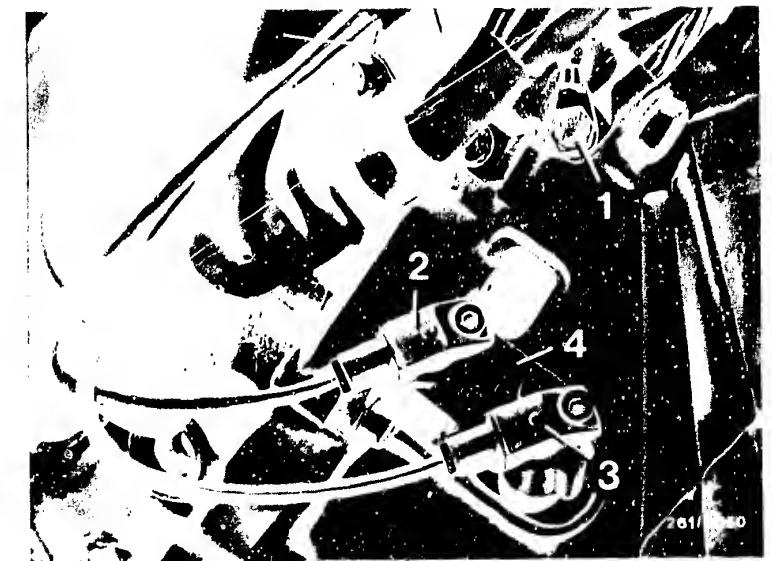
Pay attention to markings:

- Reference-mark sensor marked BG (on holder B).
- Engine-speed sensor marked DG (on holder D).

The sensors are plugged into their bores as far as they will go and are screwed down. Do not use force when inserting.
When mounting, make sure that the plug connectors are correctly assigned.
Pay attention to the correct seating and latching of the spring contacts in the plug.
Spring contacts must not allow themselves to be pushed back.



- 1=Ground terminals for Motronic
2=Reference-mark sensor (B)
3=Engine-speed sensor (D)
4=Holder



D6


Test with universal test adapter
Porsche 944 (USA)



D7

Test with universal test adapter
Porsche 944 (USA)



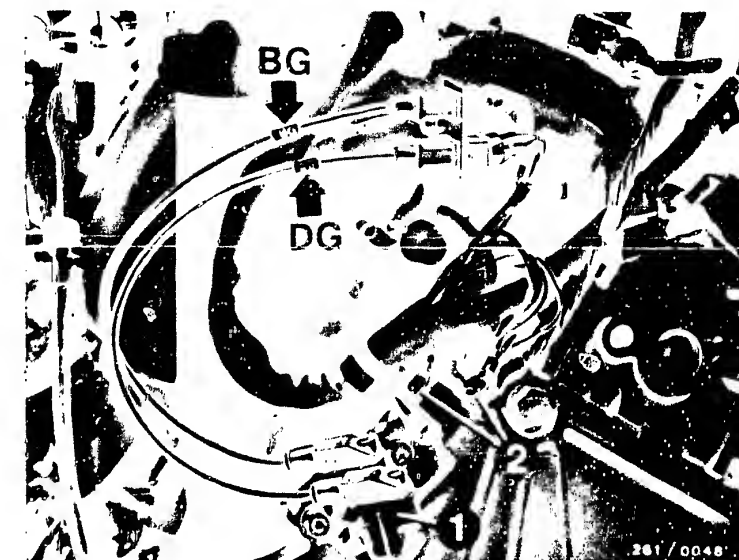
TEST STEP 4		
Operation	Reading	Testing
Program switch position "V" 	0.6 ... 1.6 k Ω	Component: Reference-mark sensor
Program switch position " Ω " 4	<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> yes ↓ Continue testing with next test step </div> <div style="text-align: center;"> no ↓ </div> </div>	Operation: Winding resistance between term. 25 and term. 26
Measuring equipment: Ohmmeter		Malfunction: Resistance not within tolerance
Measuring range: 0 to 10 k Ω		
Connection: Test sockets Ω		
Operation in vehicle: Switch off ignition		

Trouble-shooting:

- Repeat measurement directly at sensor plug.
- Check plug-in connection: Corrosion, loose contact, (spring contacts must not allow themselves to be pushed back).
- Check leads from reference-mark sensor term. 25 and term. 26 to control-unit plug term. 25 and term. 26.
- Replace the sensor.

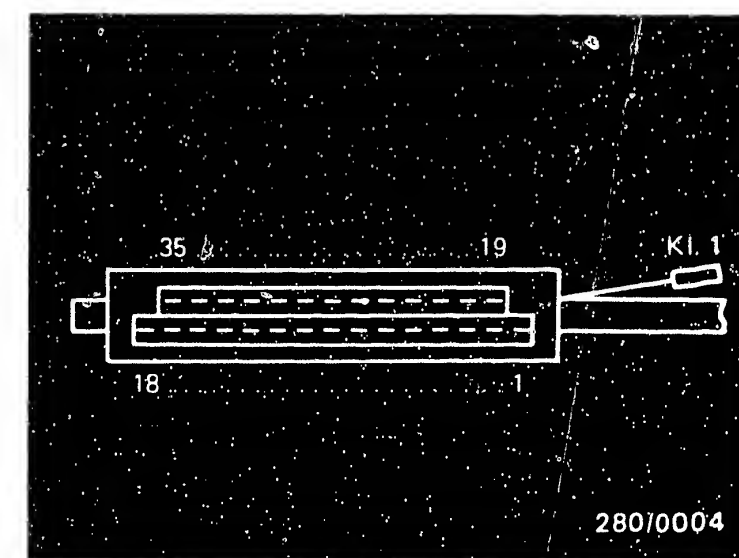
To replace the sensor, take apart the plug-in connection and unscrew hexagon-socket-head cap screw on sensor. Remove dirt deposits from sensor. If necessary, apply two screwdrivers to the recesses to left and right of the sensor and raise the sensor.
Caution: Do not loosen the holder.

Continued on D10



BG=Reference-mark sensor
 DG=Engine-speed sensor
 1=Holder
 2=Ground terminal for Motronic

Top view of control-unit plug (35-pin) with terminal numbers K1. 1=Plug-in connection to tachometer



D8

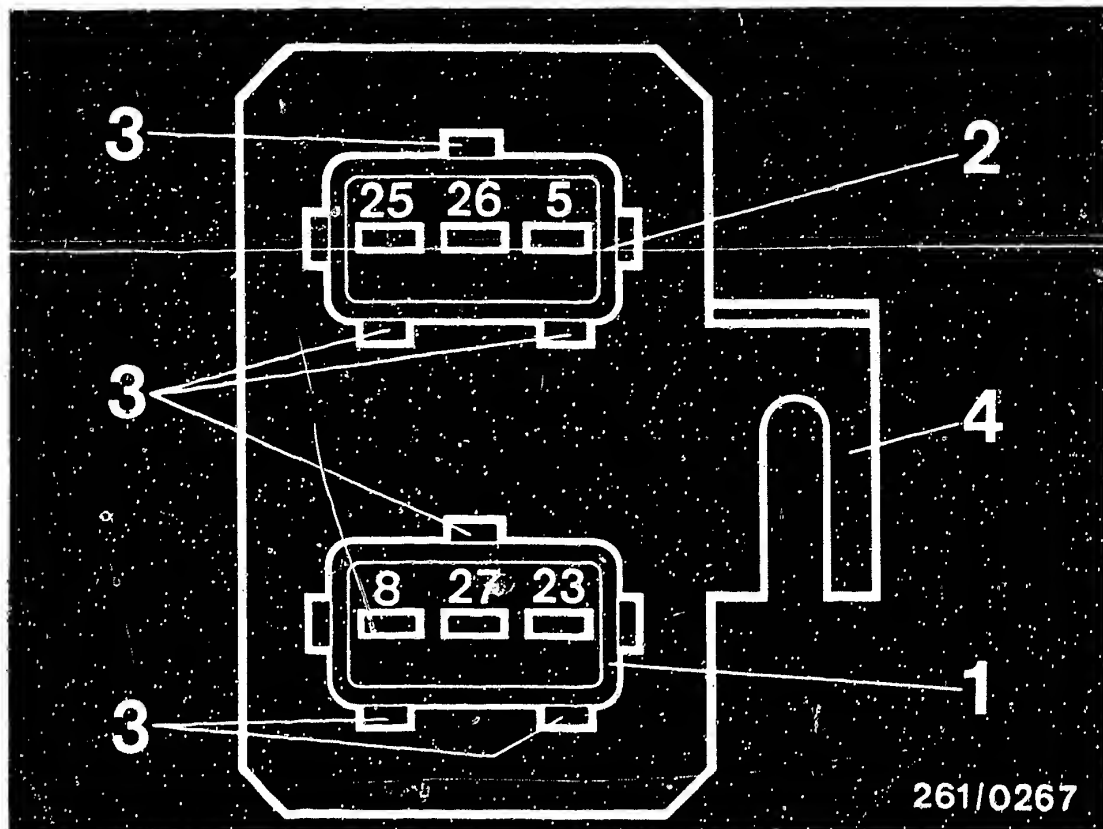
Test with universal test adapter
 Porsche 944 (USA)



D9

Test with universal test adapter
 Porsche 944 (USA)





Trouble-shooting-Test step 4 (continued)

Top view of plug connectors to sensors

- 1 = Connector of engine-speed sensor marked DG
- 2 = Connector of reference-mark sensor marked BG
- 3 = "Lugs" as locating lips
- 4 = Holding plate for sensor plug connectors
- 5,25,26,23,8,27 = Terminal numbers

Continued on D11/D12

D10

Test with universal test adapter
Porsche 944 (USA)



Trouble-shooting - Test step 4 (continued)

Before installing the sensor, make sure that no metal parts are sticking to it (sensor contains permanent magnet). Grease sensor with "Molykote Longterm 2".

Do not mix up sensors when installing.

Pay attention to markings:

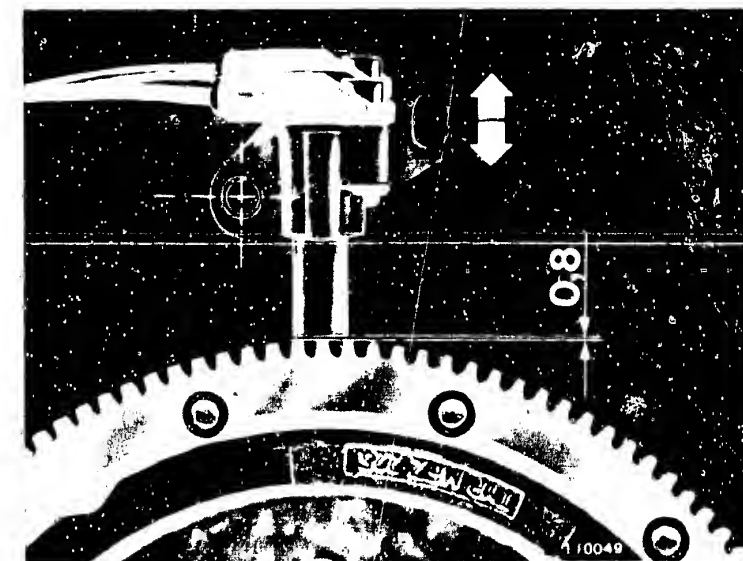
- Reference-mark sensor marked BM.
- Engine-speed sensor marked DG.

The sensors are plugged into their bores as far as they will go and are screwed down. Do not use force when inserting.

When mounting, make sure that the plug connectors are correctly assigned.

Pay attention to the correct seating and latching of the spring contacts in the plug.

Spring contacts must not allow themselves to be pushed back.

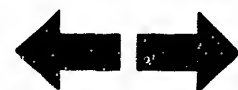


- 1=Ground terminals for Motronic
2=Reference-mark sensor (B)
3=Engine-speed sensor (D)
4=Holder



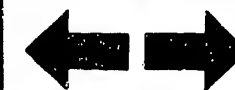
D11

Test with universal test adapter
Porsche 944 (USA)



D12

Test with universal test adapter
Porsche 944 (USA)



TEST STEP 5		Reading		Testing
Operation				
Program switch position "V"	↓	Reading is temperature-dependent, i.e. note engine temperature. At ambient temperature (+15°C...+30°C): 1.45 ... 3.3 kΩ With engine at op. temp. (approx. +80°C): 280 ... 360 Ω		Component: Engine temperature sensor (NTC II)
Program switch position "Ω"	5			
Measuring equipment: Ohmmeter				Operation: Resistance between term. 13 and ground
Measuring range: 0 to 10 kΩ		<div>yes</div> <div>no</div>		
Connection: Test sockets	Ω			Malfunction: Resistance not within tolerance. Pay attention to temperature.
Operation in vehicle: Switch off ignition.				



- 1=Throttle-valve switch
2=Engine temperature sensor (NTC II)
3=Air-flow sensor with NTC I
4=Idle-mixture-adjusting screw

Trouble-shooting:

- Disconnect plug from temperature sensor and measure resistance directly. If necessary, replace temperature sensor.
- Check leads from temperature sensor to multiple plug term. 13 and to ground terminal.
- Eliminate contact resistances at the plug-in connections. Spring contacts must not allow themselves to be pushed back.

D13

Test with universal test adapter
Porsche 944 (USA)



D14

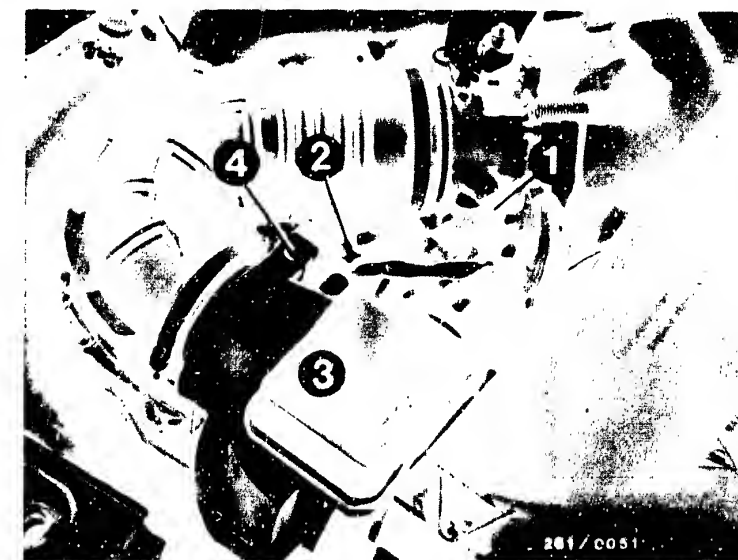
Test with universal test adapter
Porsche 944 (USA)



TEST STEP 6				
Operation		Reading	Testing	
Program switch position "V"	↓	Reading is temperature-dependent, i.e. note engine temperature. At ambient temperature (+15°C...+30°C): <u>1.45 ... 3.3 kΩ</u> With engine at op. temp. (approx. +80°C) <u>280 ... 360 Ω</u>	Component	
Program switch position "Ω"	6		Air temperature sensor (NTC II)	
Measuring equipment: Ohmmeter			Operation: Resistance between term. 22 and ground.	
Measuring range: 0 to 10 kΩ		<div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;"> yes ↓ Continue testing with next test step </div> <div style="text-align: center;"> no ↓ </div> </div>	Malfunction:	
Connection: Test sockets	Ω		Resistance not within tolerance. Pay attention to temperature.	
Operation in vehicle: Switch off ignition				

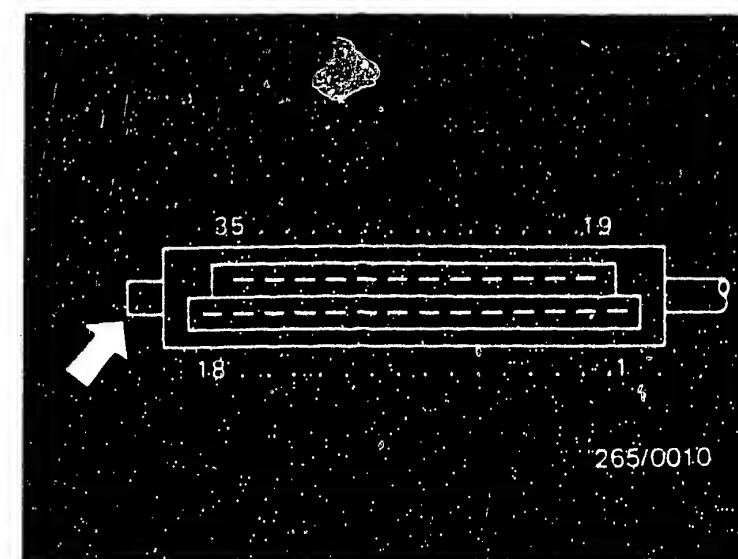
Trouble-shooting:

- Disconnect plug from air-flow sensor and measure resistance directly at term. 22 and term. 6. If reading not within tolerance, replace air-flow sensor.
- Leads from air-flow sensor term. 6 and term. 22 to control-unit plug term. 6 and term. 22.
- Eliminate contact resistances in the plug-in connections. Spring contacts must not allow themselves to be pushed back.



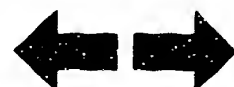
- 1=Throttle-valve switch
 2=Engine temperature sensor (NTC II)
 3=Air-flow sensor with NTC I
 4=Idle-mixture-adjusting screw

Top view of control-unit plug (35-pin) with terminal numbers. Arrow="Lug" with mechanical encoding



D 15

Test with universal test adapter
 Porsche 944 (USA)



D 16

Test with universal test adapter
 Porsche 944 (USA)



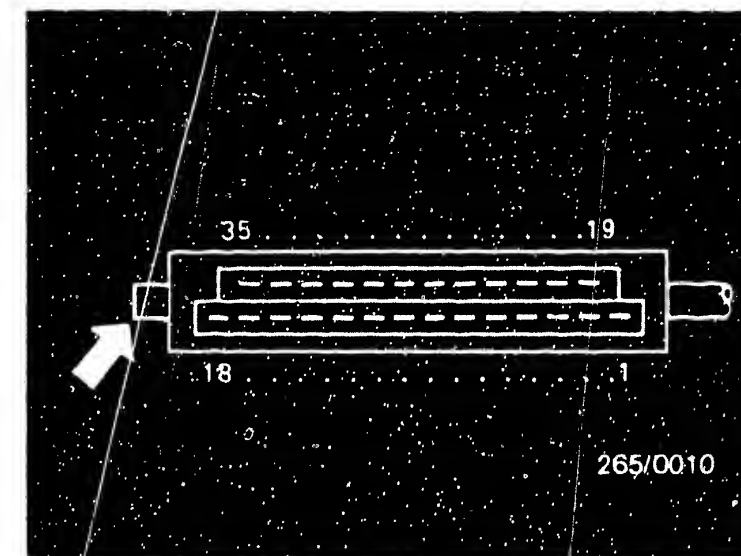
TEST STEP 7		Reading	Testing
<u>Operation</u>			
Program switch position "V"	↓	For USA (in general): $\infty \Omega$	<u>Component:</u> Lead
Program switch position " Ω "	7	for California and Japan version: less than 10 Ω	
<u>Measuring equipment:</u> Ohmmeter			<u>Operation:</u> Connection between term. 10 and ground
<u>Measuring range:</u> 0 to 10 k Ω			
<u>Connection:</u> Test sockets Ω		yes ↓ Continue testing with next test step	<u>Malfunction:</u> Resistance less than $\infty \Omega$ or greater than 10 Ω
<u>Operation in vehicle:</u> Switch off ignition		no ↓	

Trouble-shooting:
(USA in general):

- Take apart connection between control-unit plug term. 10 and ground.

California and Japan version:

- Connect map plug or remedy open circuit between multiple plug term. 10 and ground



Top view of control-unit plug (35-pin) with terminal numbers. Arrow="Lug" with mechanical encoding

D17

Test with universal test adapter
Porsche 944 (USA)



D18

Test with universal test adapter
Porsche 944 (USA)



TEST STEP 9 (Test step 8 not applicable)			
Operation		Reading	Testing
Program switch position "V"	↓	Accelerator in rest position:	Component: Throttle-valve switch
Program switch position "Ω"	9	less than 10 Ω (measured value is influenced by protective resistor in adapter)	Operation: Idle contact between terminal 2 and ground
Measuring equipment: Ohmmeter		Press accelerator (Part-load range)	Malfunction: Resistance in rest position greater than 10 Ω or less than ∞Ω.
Measuring range: 0 to 10 kΩ		yes	
Connection: Test sockets	Ω	no	
Operation in vehicle: Switch off ignition		Continue testing with next test step	

Trouble-shooting:

1) Adjusting the throttle-valve switch:

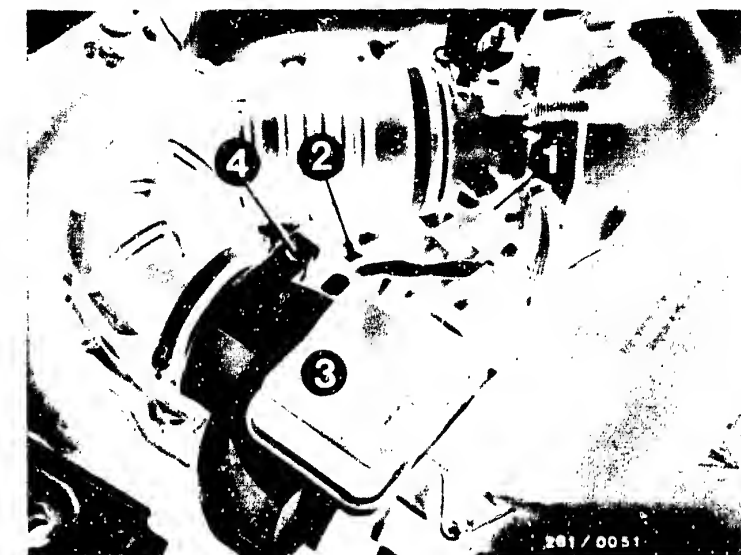
Loosen fastening screws. Turn actuating lever to wide-open throttle and slowly return to idle stop.

Turn switch in clockwise direction until the inner stop can be felt. Tighten screws. Check: Slowly open accelerator in full-load direction. After a short actuation travel the reading must change to ∞Ω.

If adjustment not possible:

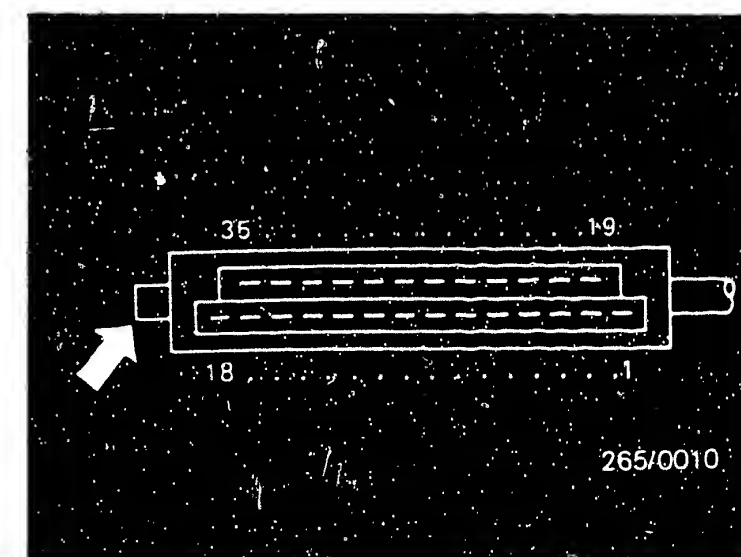
Check Bosch throttle-valve switch as well as leads from throttle-valve switch term. 2 and term. 43 to control-unit plug term. 2 and ground terminal. Eliminate contact resistances.

Spring contacts must not allow themselves to be pushed back.



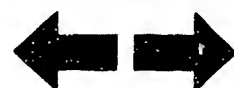
- 1=Throttle-valve switch
- 2=Engine temperature sensor (NTC II)
- 3=Air-flow sensor with NTC I
- 4=Idle-mixture-adjusting screw

Top view of control-unit plug (35-pin) with terminal numbers. Arrow="Lug" with mechanical encoding



D19

Test with universal test adapter
Porsche 944 (USA)



D20

Test with universal test adapter
Porsche 944 (USA)



TEST STEP 10		Reading	Testing
Operation			
Program switch position "V"	↓	Accelerator in part-load position:	Component: Throttle-valve switch
Program switch position "Ω"	10	Accelerator in full-load position:	
Measuring equipment:		less than 10 Ω 1)	Operation: Full-load contact between terminal 3 and ground
Ohmmeter		(measured value is influenced by protective resistor in adapter)	
Measuring range:			Malfunction: Resistance at full load greater than 10 Ω or ∞Ω.
0 to 10 kΩ		yes	
Connection:		no	
Test sockets	Ω	Continue testing with next test step	
Operation in vehicle:			
Switch off ignition			

Trouble-shooting:

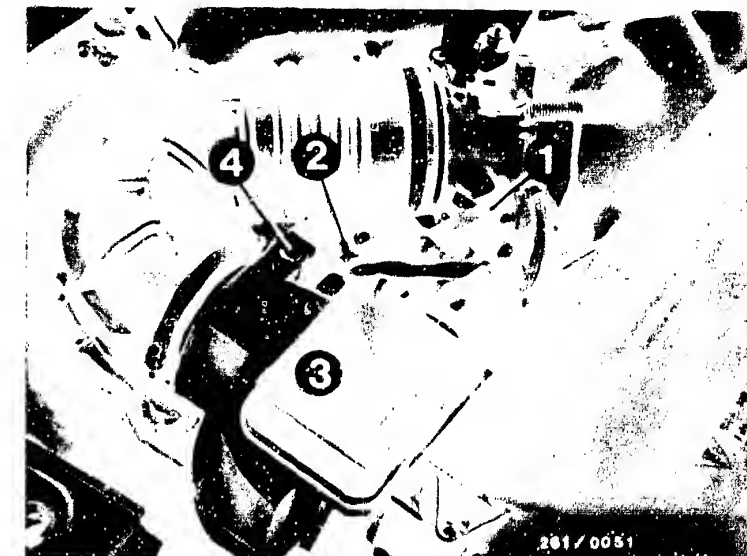
1) Check: Actuate throttle valve in full-load direction. Just before actuating lever reaches the full-load stop reading to values less than 10 Ω (full-load contact closed).

Reading greater than 10 Ω or ∞Ω:

Check whether throttle valve is opening fully. Check throttle linkage/bowden cable from accelerator to throttle valve. Check Bosch throttle-valve switch as well as lead from throttle-valve switch term. 3 to control-unit plug term. 3.

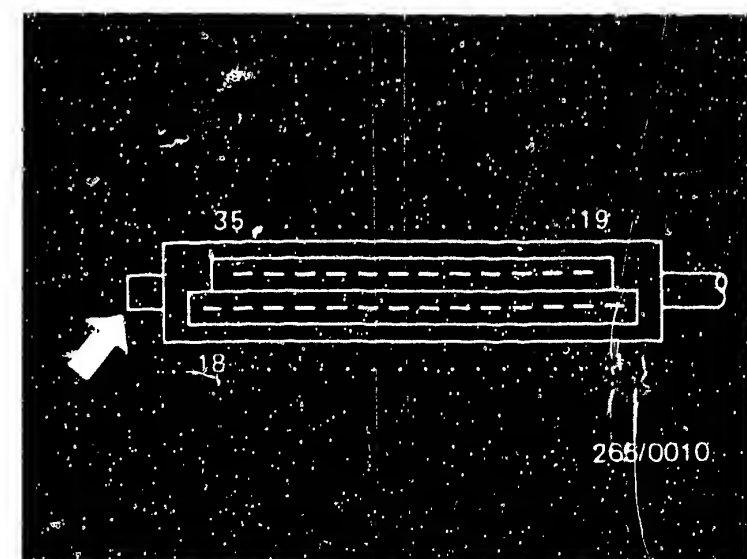
Eliminate contact resistances.

Spring contacts must not allow themselves to be pushed back.



1=Throttle-valve switch
2=Engine temperature sensor (NTC II)
3=Air-flow sensor with NTC I
4=Idle-mixture-adjusting screw

Top view of control-unit plug (35-pin) with terminal numbers. Arrow="Lug" with mechanical encoding



D21

Test with universal test adapter
Porsche 944 (USA)



D22

Test with universal test adapter
Porsche 944 (USA)



TEST STEP 11			
Operation		Reading	Testing
Program switch position "V"	↓	less than 10 Ω (measured value is influenced by protective resistor in adapter)	Component: Ground lead
Program switch position " Ω "	11		
Measuring equipment: Ohmmeter		<div>yes</div> <div>no</div>	Operation: Contact resistance between term. 16 and ground Malfunction: Resistance greater than 10 Ω
Measuring range: 0 to 10 k Ω			
Connection: Test sockets	Ω		
Operation in vehicle: Switch off ignition		Continue testing with next test step	

Trouble-shooting:

For testing, disconnect wiring-harness plug from test adapter and use circuit diagram if necessary.

Check the following leads for continuity with ohmmeter

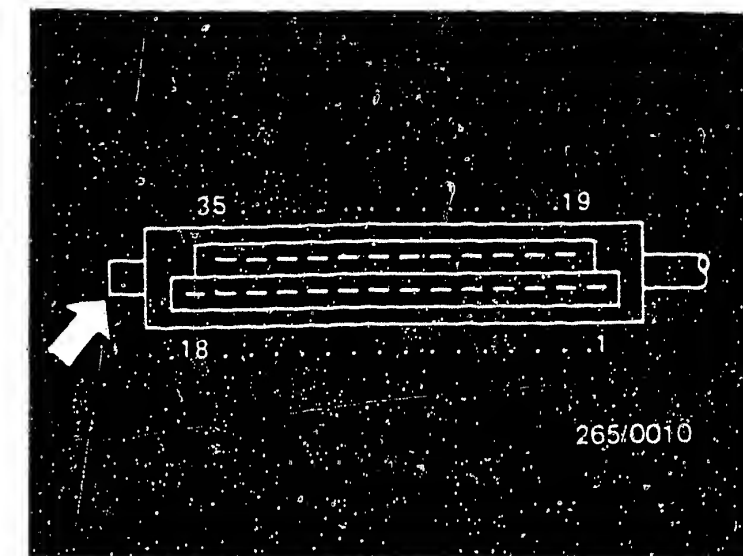
(Set value approx. 0 Ω):

From control-unit plug term. 16 to output stage ground terminal.

From control-unit plug term. 5 to electronics ground terminal.

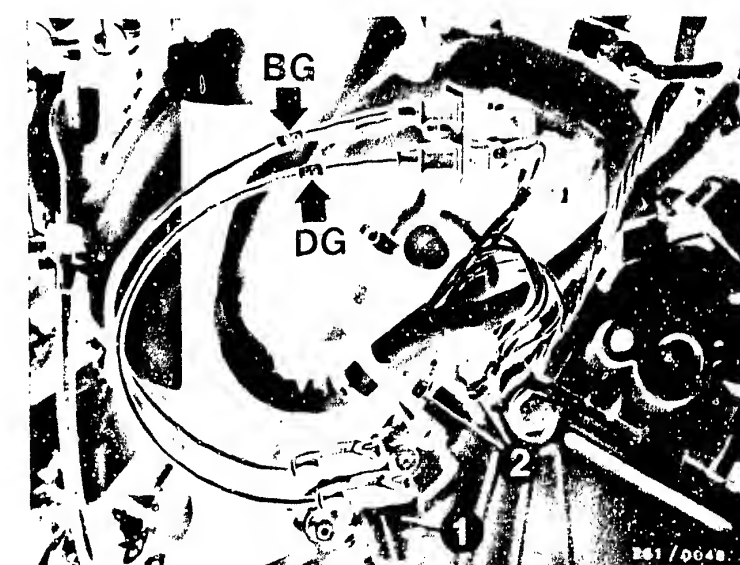
Eliminate contact resistances at connection points.

Spring contacts must not allow themselves to be pushed back.



Top view of control-unit plug (35-pin) with terminal numbers.
Arrow="Lug" with mechanical encoding

BG=Reference-mark sensor
DG=Engine-speed sensor
1=Holder
2=Ground terminal for Motronic



D23


Test with universal test adapter
Porsche 944 (USA)



D24

Test with universal test adapter
Porsche 944 (USA)



TEST STEP 12			
Operation		Reading	Testing
<u>Program switch position "V"</u>		less than 10 Ω (measured value is influenced by protective resistor in adapter)	<u>Component:</u> Ground lead
<u>Program switch position "Ω"</u>	12		
<u>Measuring equipment:</u> Ohmmeter		<div><div>yes</div><div>↓</div></div> <div>Continue testing with next test step</div> <div>no</div> <div>↓</div>	<u>Operation:</u> Contact resistance between term. 17 and ground
<u>Measuring range:</u> 0 to 10 kΩ			<u>Malfunction:</u> Resistance greater than 10 Ω
<u>Connection:</u> Test sockets	Ω		
<u>Operation in vehicle:</u> Switch off ignition			

Trouble-shooting:

For testing, disconnect wiring-harness plug from test adapter and use circuit diagram if necessary.

Check the following leads for continuity with ohmmeter

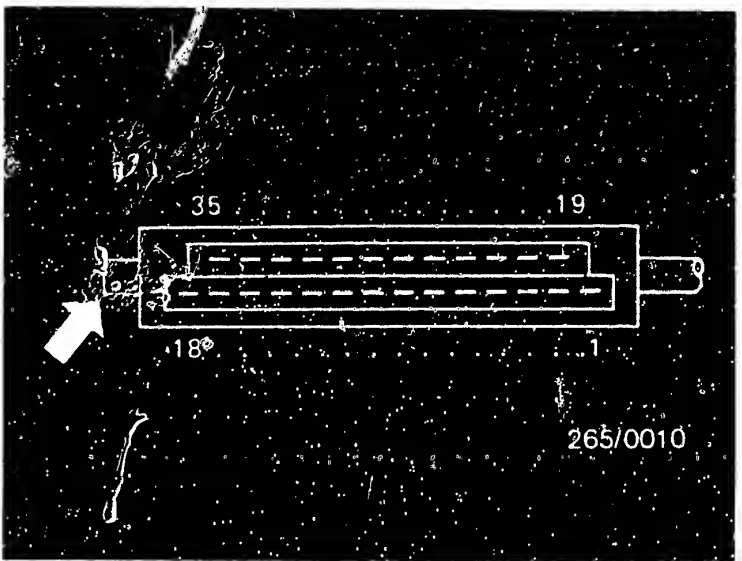
(Set value approx. 0 Ω):

From control-unit plug term. 17 to output stage ground terminal.

From control-unit plug term. 5 to electronics ground terminal.

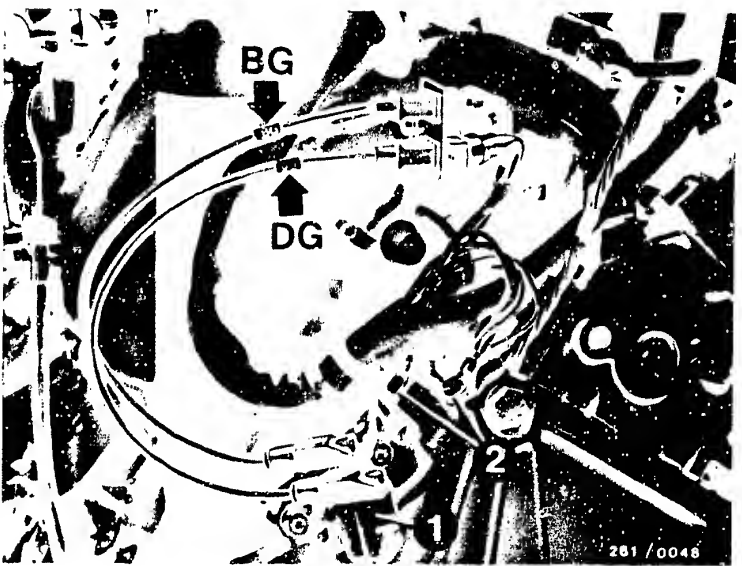
Eliminate contact resistances at connection points.

Spring contacts must not allow themselves to be pushed back



Top view of control-unit plug (35-pin) with terminal numbers. Arrow="Lug" with mechanical encoding

BG=Reference-mark sensor
DG=Engine-speed sensor
1=Holder
2=Ground terminal for Motronic



E1

Test with universal test adapter
Porsche 944 (USA)



E2

Test with universal test adapter
Porsche 944 (USA)



TEST STEP 13		
Operation	Reading	Testing
<u>Program switch position "V"</u>	<div>less than 10 Ω</div> <div>(Measured value is influenced by protective resistor in adapter)</div>	<u>Component:</u> Ground lead
<u>Program switch position "Ω"</u>		
<u>Measuring equipment:</u> Ohmmeter		<u>Operation:</u> Contact resistance between term. 19 and ground
<u>Measuring range:</u> 0 to 10 k Ω		
<u>Connection:</u> Test sockets	<div>yes</div> <div>Continue testing with test step 15 (Test step 14 not applicable)</div>	<u>Malfunction:</u> Resistance greater than 10 Ω
<u>Operation in vehicle:</u> Switch off ignition		

Trouble-shooting:

For testing, disconnect wiring-harness plug from test adapter and use circuit diagram if necessary.

Check the following leads for continuity with ohmmeter

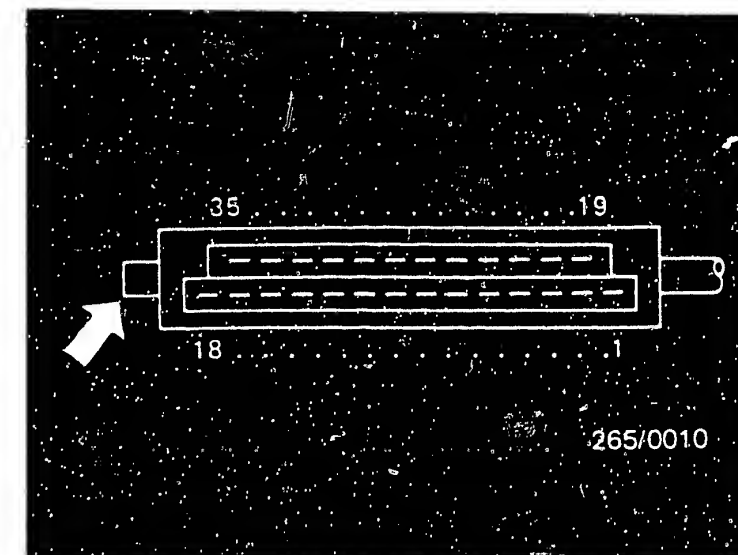
(Set value approx. 0 Ω):

From control-unit plug term. 19 to output stage ground terminal.

From control-unit plug term. 5 to electronics ground terminal.

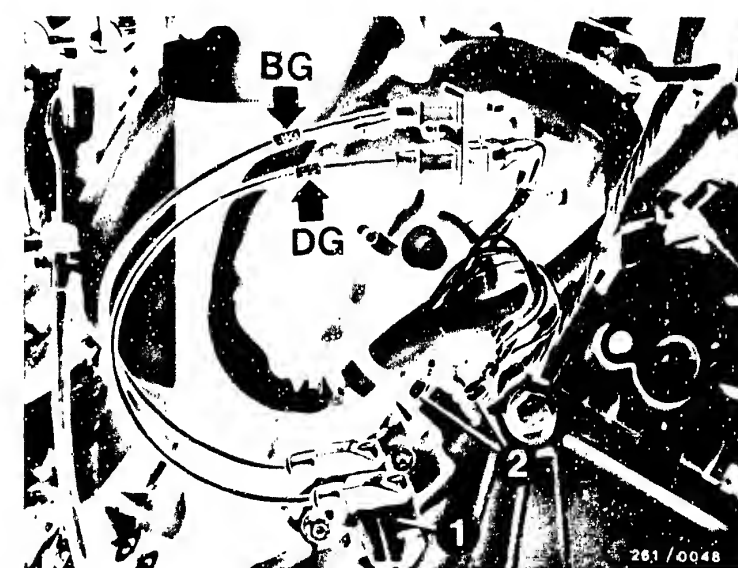
Eliminate contact resistances at connection points.

Spring contacts must not allow themselves to be pushed back.



Top view of control-unit plug (35-pin) with terminal numbers.
Arrow="Lug" with mechanical encoding

BG=Reference-mark sensor
DG=Engine-speed sensor
1=Holder
2=Ground terminal for Motronic



E3


Test with universal test adapter
Porsche 944 (USA)



E4

Test with universal test adapter
Porsche 944 (USA)



TEST STEP 15 (Test step 14 not applicable)			
Operation		Reading	Testing
Program switch position "V"		Above 1000 m altitude the contact is closed: less than 10 Ω	Component: Altitude sensor (switch)
Program switch position "Ω"	15	Below 1000 m altitude the contact open: ∞Ω	
Measuring equipment: Ohmmeter		<div><div>yes</div><div>↓</div><div>Continue testing with next test step</div></div> <div><div>no</div><div>↓</div></div>	Operation: Altitude dependence of contact term. 28 to ground (term. 5)
Measuring range: 0 to 10 kΩ			
Connection: Test sockets	Ω		
Operation in vehicle: Switch off ignition			
			Malfunction: Resistance greater than 10 Ω or less than ∞Ω.

Trouble-shooting:

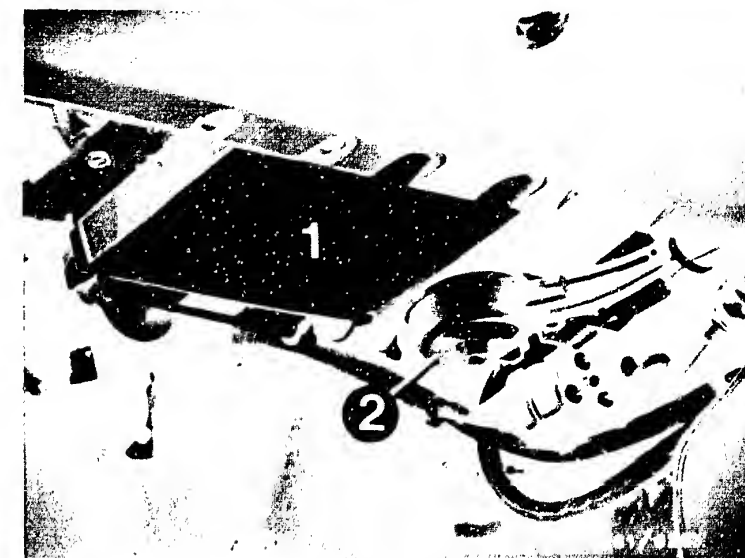
For testing, disconnect wiring-harness plug from test adapter and use circuit diagram if necessary.

Check the following leads for continuity with ohmmeter (Set value approx. 0 Ω):

- From control-unit plug term. 28 to altitude sensor (switch)
- From ground to altitude sensor (switch)

Eliminate contact resistances at the connection points.

Spring contacts must not allow themselves to be pushed back.



up to 1.85
1=Control unit
2=Altitude sensor

E5

Test with universal test adapter
Porsche 944 (USA)

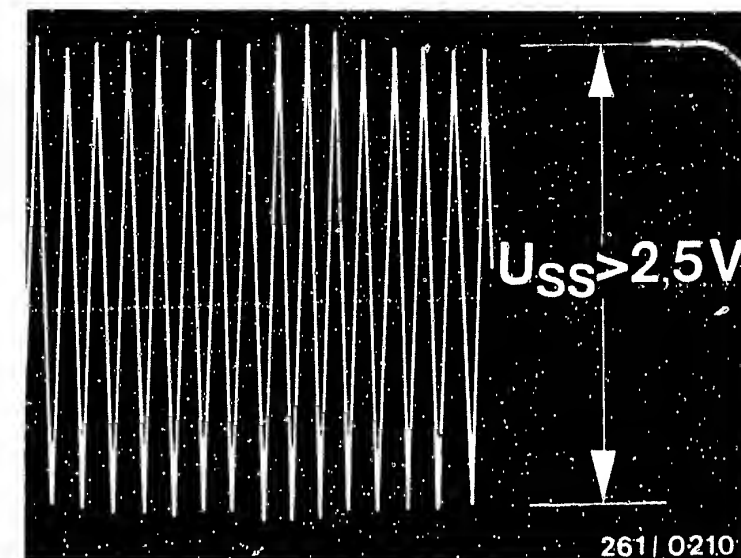


E6

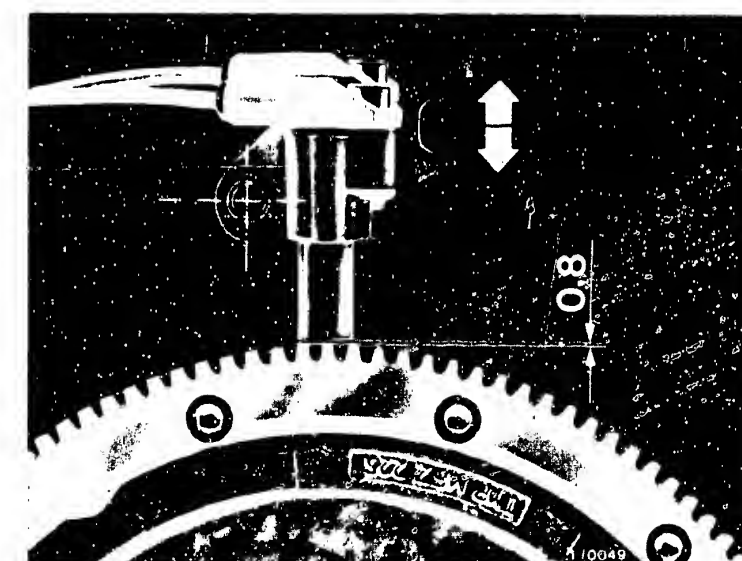
Test with universal test adapter
Porsche 944 (USA)



TEST STEP 16 (Test step 14 not applicable)		
Operation	Reading	Testing
Program switch position "V"	1	Component: Engine-speed sensor
Program switch position "Ω"	15	
Measuring equipment: Motortester, oscilloscope	<div> <div>Engine-speed sensor signal (see top diagram)</div> <div>Lever to left-hand stop (calibrated voltage range).</div> </div>	Operation: Amplitude (signal) at terminals 8 and 27
Measuring range: Special input		
Connection: Test wells; red clip to red well, black clip to black well	<div> <div>yes</div> <div>no</div> </div>	Malfunction: No signal or signal too small. Defective signal
Operation in vehicle: Shift gear to neutral and start		
	Continue testing with next test step	



Engine-speed sensor signal



Trouble-shooting:

No signal or signal too small:

- Cranking speed less than 200 min⁻¹; charge battery.
- The air gap (nominal dimension 0.8 mm) can be measured directly with a feeler gauge only with the engine removed. Slide feeler gauge 0.8 mm between ring gear and engine-speed sensor. If necessary, loosen screws on holder and adjust air gap by turning the holder.

Continued on E9/E10

E7

Test with universal test adapter
Porsche 944 (USA)



E8

Test with universal test adapter
Porsche 944 (USA)



Trouble-shooting - Test step 16 (continued)

With the engine installed, check the air gap as follows:

With the engine-speed sensor removed, measure the length of the sensor with a depth gauge. Make a note of the measurement. Using a depth gauge, measure the bore depth of the holder as far as the tip of the tooth. Do not measure into the tooth gap. The difference between both measurements (bore depth minus sensor length) must be between 0 and 0.8 mm. If necessary, loosen screws on holder and adjust air gap by turning the holder.

- Incorrect signal (greatly extended in bottom diagram):
Heavily damaged tooth on starting-motor ring gear. Replace ring gear.
- Replacing the engine-speed sensor:
Unscrew hexagon-socket-head cap screw on sensor. Remove dirt deposits from sensor. If necessary, apply two screwdrivers to the recesses to left and right of the sensor and raise the sensor.

Caution: Do not loosen the holder.

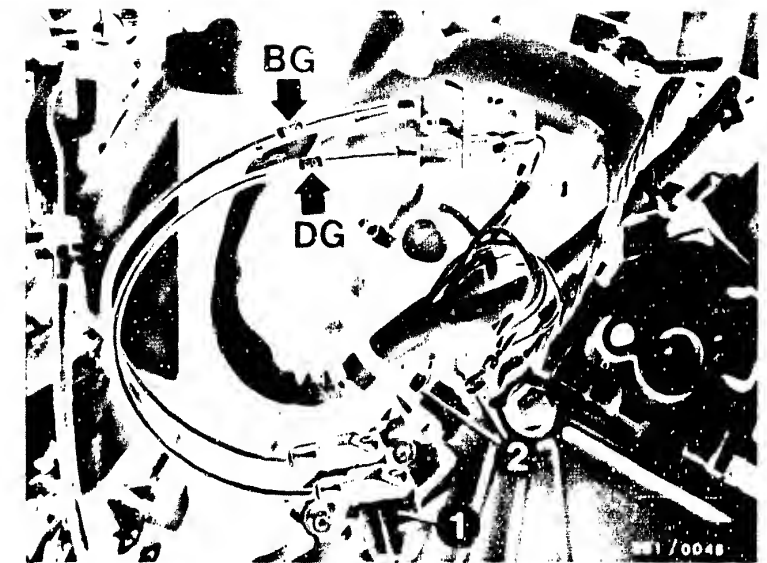
Before installing the sensors, make sure that no metal parts are sticking to it (sensor contains permanent magnet). Grease sensor with "Molykote Longterm 2".

Do not mix up sensors when installing.

Pay attention to markings:

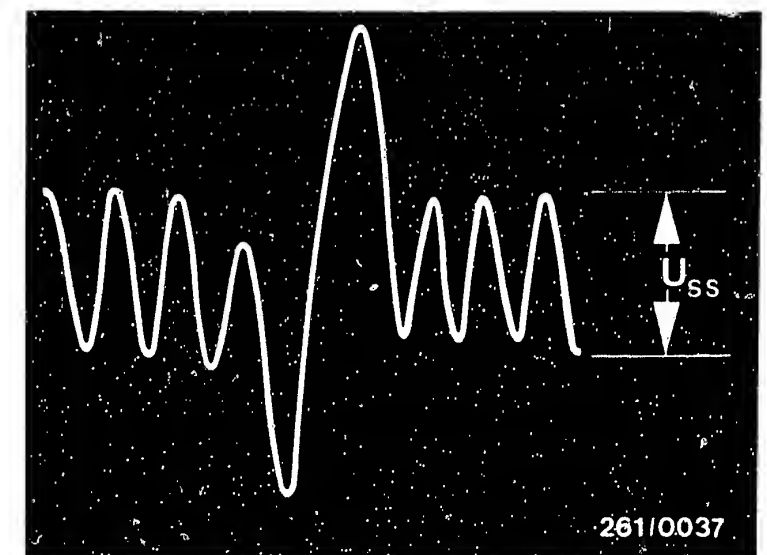
- Reference-mark sensor marked BG (on holder B).
- Engine-speed sensor marked DG (on holder D).

The sensors are plugged into their bores as far as they will go and are screwed down. Do not use force when inserting. When mounting, make sure that the plug connectors are correctly assigned. Pay attention to the correct seating and latching of the spring contacts in the plug. Spring contacts must not allow themselves to be pushed back.



BG=Reference-mark sensor
DG=Engine-speed sensor
1=Holder
2=Ground terminals for Motronic

Incorrect engine-speed sensor signal



E9

Test with universal test adapter
Porsche 944 (USA)

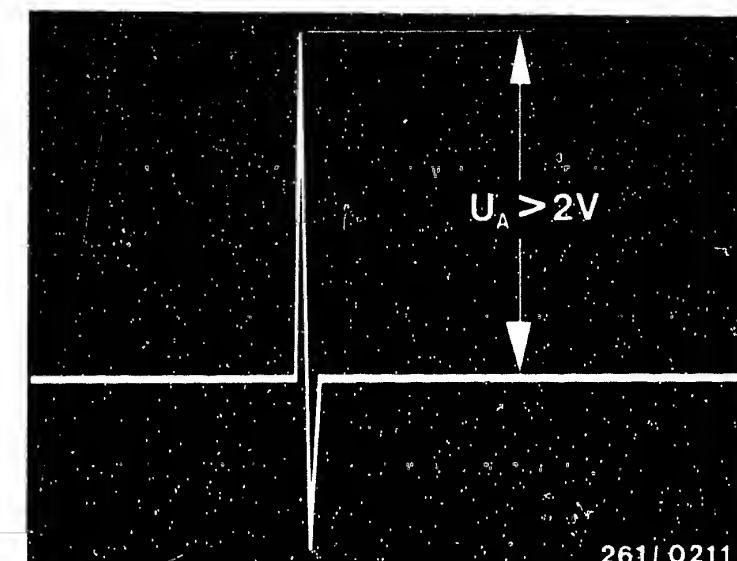


E10

Test with universal test adapter
Porsche 944 (USA)



TEST STEP 17			
Operation		Reading	Testing
Program switch position "V"	2	Reference-mark sensor signal (see top diagram)	Component: Reference-mark sensor
Program switch position "Ω"	15	Lever at left-hand stop (calibrated voltage range)	Operation: Amplitude (signal) at terminals 25 and 26
Measuring equipment: Motortester, oscilloscope			
Measuring range:			
Special input			
Connection: Test wells; red clip to red well, black clip to black well			
Operation in vehicle: Shift gear to neutral and start		<div> <div>yes</div> <div>↓</div> <div>Continue testing with test step 19</div> <div>(Test step 18 not applicable)</div> </div> <div>no</div> <div>↓</div>	<div>Malfunction:</div> <div>No signal or signal too small.</div> <div>Incorrect signal. Negative peak coming first.</div>



Reference-mark sensor signal
Positive peak must come first.

Trouble-shooting:

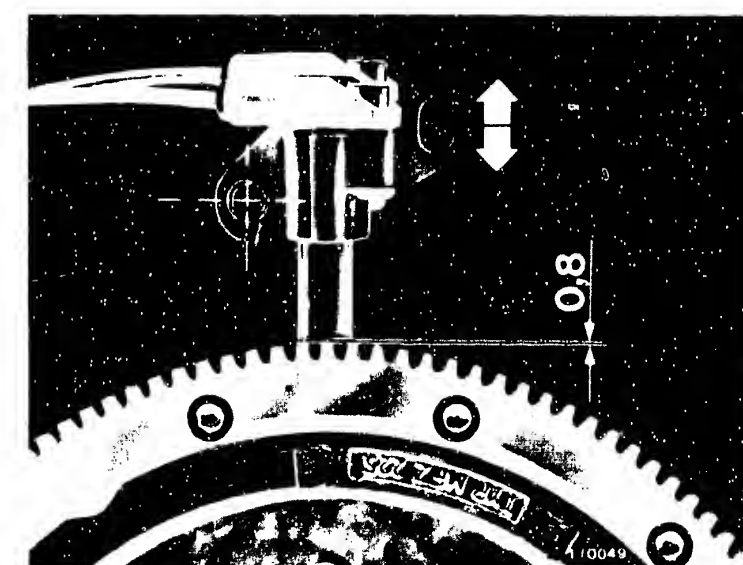
No signal or signal too small:

- Cranking speed less than 200 min⁻¹ - charge battery.
- The nominal air gap is 0.8 mm. It is correctly adjusted together with the air gap of the engine-speed sensor.

Only in the case of damage to or replacement of the bonded-in reference-mark screw in the flywheel is it also necessary to check the air gap of the reference-mark sensor.

Have the repairs carried out at a Porsche garage.

Continued on E13/E14



E11

Test with universal test adapter
Porsche 944 (USA)



E12

Test with universal test adapter
Porsche 944 (USA)



Trouble-shooting - Test step 17 (continued)

- Replacing the reference-mark sensor:
Unscrew hexagon-socket-head cap screw on sensor. Remove dirt deposits from sensor.
If necessary, apply two screwdrivers to the recesses to left and right of the sensor and raise the sensor.

Caution: Do not loosen the holder.

Before installing the sensors, make sure that no metal parts are sticking to it (sensor contains permanent magnet). Grease sensor with "Molykote Longterm 2".

Do not mix up sensors when installing.

Pay attention to markings:

- Reference-mark sensor marked BG (on holder B).
- Engine-speed sensor marked DG (on holder D).

The sensors are plugged into their bores as far as they will go and are screwed down.
Do not use force when inserting.

When mounting, make sure that the plug connectors are correctly assigned.
Pay attention to the correct seating and latching of the spring contacts in the plug.
Spring contacts must not allow themselves to be pushed back.

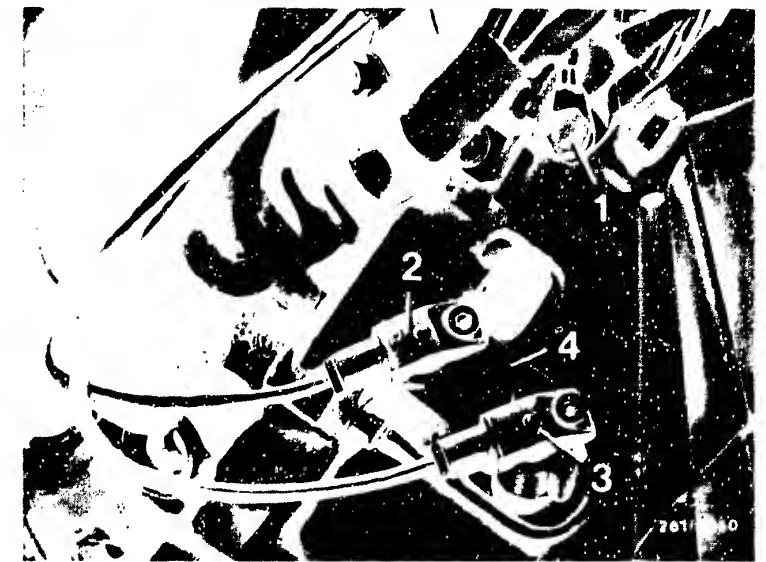
- Incorrect signal:

Incorrect if negative peak coming first.

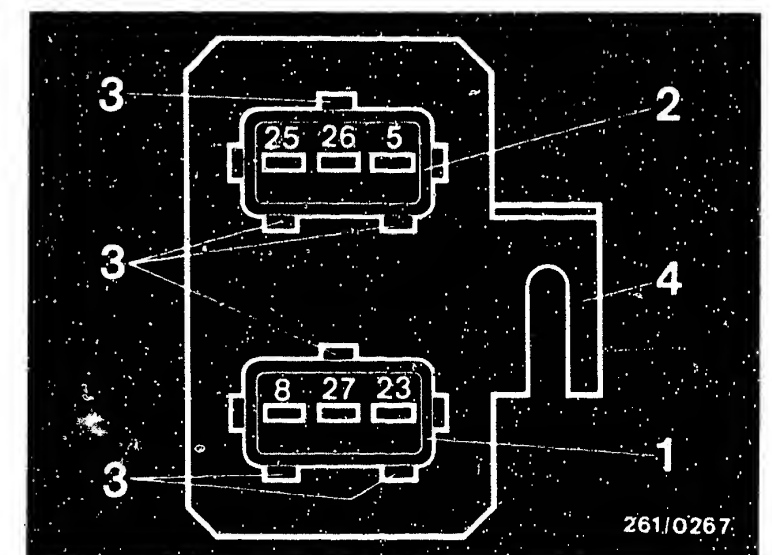
Check assignment of leads according to circuit diagram and picture opposite.

Top view of plug connectors to sensors (bottom picture)

- 1 = Connector from engine-speed sensor
- 2 = Connector from reference-mark sensor with marking
- 3 = "Lugs" as locating lip
- 4 = Holding plate for sensor plug connectors
- 5,25,26,23,8,27 = Terminal numbers



1=Ground terminals for Motronic
2=Reference-mark sensor (B)
3=Engine-speed sensor (D)
4=Holder



E13

Test with universal test adapter
Porsche 944 (USA)



E14

Test with universal test adapter
Porsche 944 (USA)

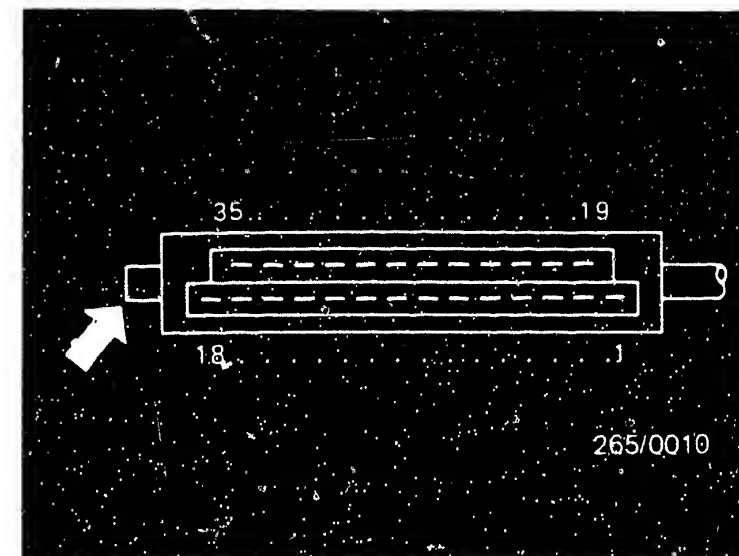


TEST STEP 19 if air conditioner installed. (TEST STEP 18 not applicable)

Operation		Reading	Testing	
<u>Program switch position "V"</u>	4	Switch on air conditioner (compressor must operate) <u>greater than 8 V</u>	<u>Component:</u> Lead to air conditioner	
<u>Program switch position "Ω"</u>	15			
<u>Measuring equipment:</u> Voltmeter		<div><div>yes</div><div>no</div></div>	<u>Operation:</u> Voltage after switching on air conditioner. Term. 29 to term. 5	
<u>Measuring range:</u> 15 V				
<u>Connection:</u> Test sockets (red = +, black = ground)	V		<div>Continue testing with next test step</div>	<u>Malfunction:</u> Voltage less than 8 V
<u>Operation in vehicle:</u> Switch on ignition				

Trouble-shooting:

- Check lead from control-unit plug term. 29 to switch of air conditioner.
- Check plug-in connections for corrosion, latching and wire break.



Top view of control-unit plug (35-pin) with terminal numbers.
Arrow="Lug" with mechanical encoding

E15

Test with universal test adapter
Porsche 944 (USA)

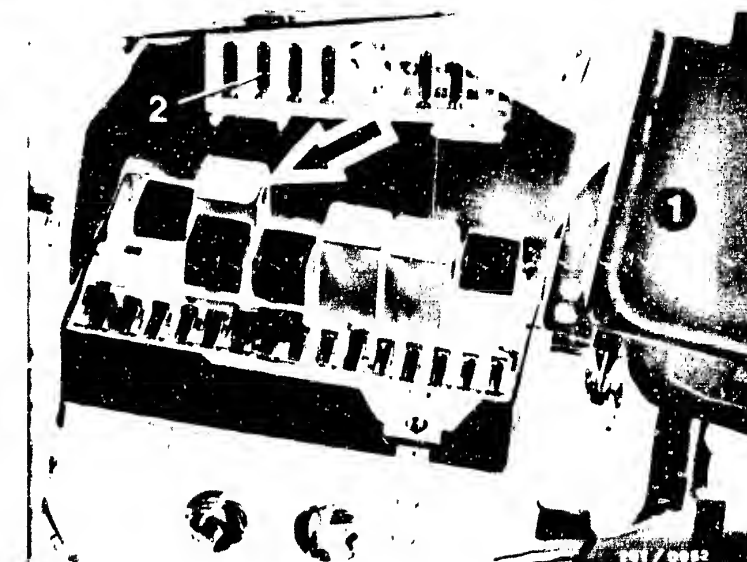


E16

Test with universal test adapter
Porsche 944 (USA)

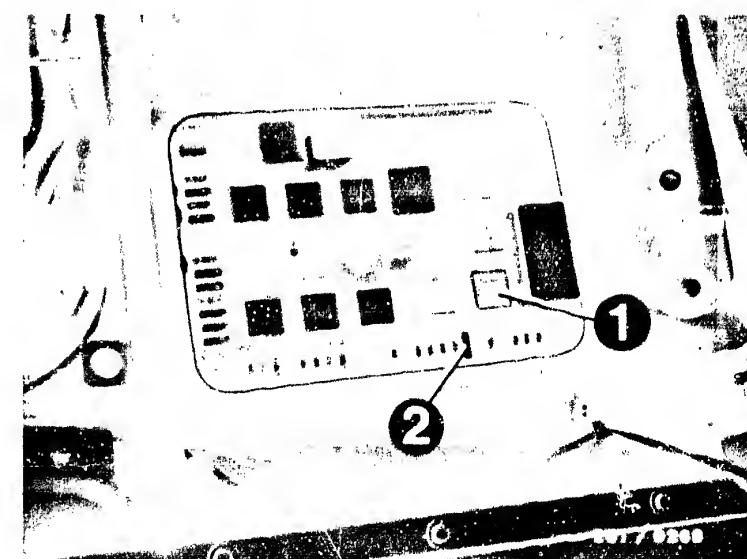


TEST STEP 20			
Operation		Reading	Testing
Program switch position "V"	6	10 ... 15 V	Component: Relay (main relay) set
Program switch position "Ω"	15		
Measuring equipment: Voltmeter		<div> <div>yes</div> <div>↓</div> <div>Continue testing with next test step</div> </div>	<div> <div>Operation: Supply voltage for control unit at terminals 35 (+) and 5 (ground)</div> <div>Malfunction: Voltage less than 10 V</div> </div>
Measuring range: 15 V			
Connection: Test sockets (red = +, black = ground)	V		
Operation in vehicle: Switch on ignition		no ↓	



up to 1.85
 Arrow=Relay set
 1=Control unit
 2=Pump fuse

as of 1.85:
 1=Relay set G5
 2=Pump fuse No. 34



Trouble-shooting:

1. Voltage less than 10 V: Battery insufficiently charged or high voltage drops at terminals.
2. No voltage reading: Check relay set. Make following voltage measurements at relay base with ignition on:
 - Measure battery voltage at term. 87, term. 86 and term. 30:
Measure ground connection term. 85 to B + (test adapter connected).
 - Check lead from relay set term. 87 through plug-in connection term. 3 to control-unit plug term. 35.
 - Check Motronic ground terminal.

E17

Test with universal test adapter
 Porsche 944 (USA)

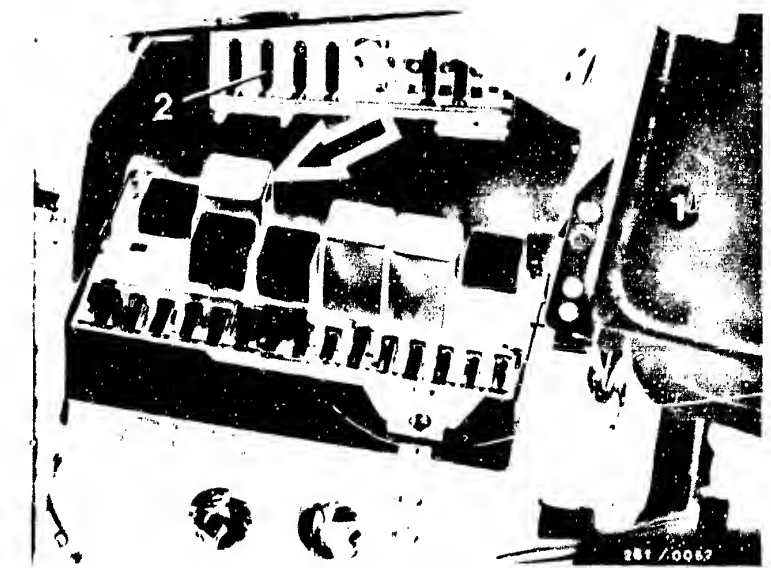


E18

Test with universal test adapter
 Porsche 944 (USA)

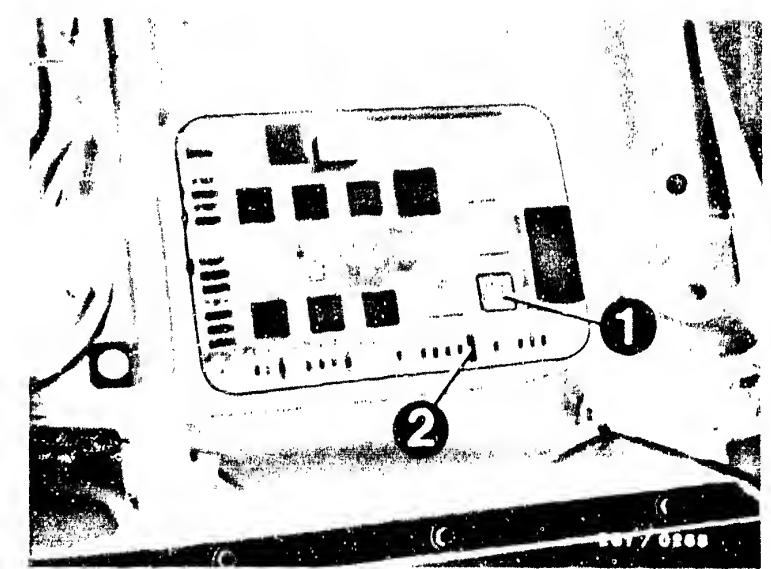


TEST STEP 21			
Operation		Reading	Testing
Program switch position "V"	7	10 ... 15 V	Component: Relay (main relay) set
Program switch position "Ω"	15		
Measuring equipment: Voltmeter		<div><div>yes</div><div>no</div></div>	Operation: Supply voltage for control unit at terminals 18 (+) and 5 (ground)
Measuring range: 15 V			
Connection: Test sockets (red = +, black = ground)	V		
Operation in vehicle: Switch on ignition			
		Continue testing with next test step	Malfunction: Voltage less than 10 V



Arrow=Relay set
 1=Control unit
 2=Pump fuse

as of 1.85:
 1=Relay set G5
 2=Pump fuse No. 34



Trouble-shooting:

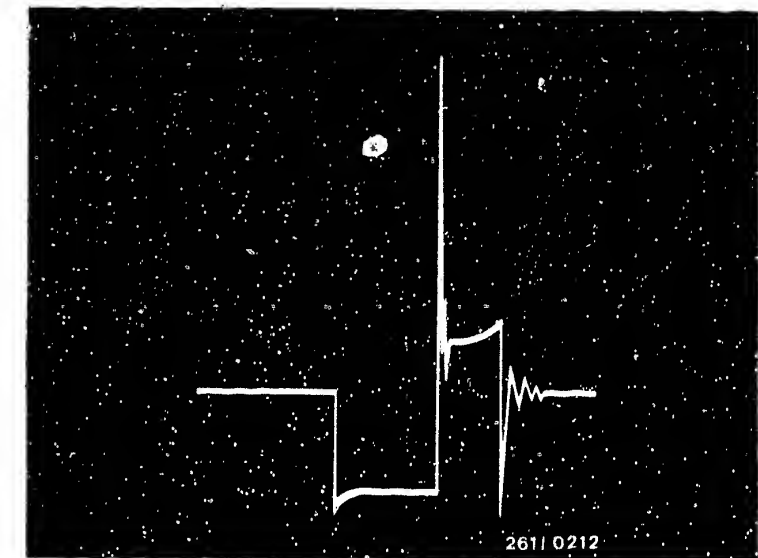
- Check lead from control-unit plug term. 18 to plug-in connection term. 3.

TEST STEP 22 Ignition off. Connect control unit and connect pump fuse

Operation		Reading	Testing
Program switch position "V"	5	Primary signal present (see top diagram)	<u>Component:</u> Ignition coil, ignition cables, control unit
Program switch position "Ω"	15		
<u>Measuring equipment:</u> Motortester, oscilloscope			
<u>Measuring range:</u> Special input			
<u>Connection:</u> Test wells; red clip to red well, black clip to black well. Triggering on cylinder 1			
<u>Operation in vehicle:</u> Shift gear to neutral and start			
		yes ↓ Continue testing with next test step	<u>Operation:</u> Primary signal from ignition coil terminal 1 to ground
		no ↓	<u>Malfunction:</u> No signal or signal defective

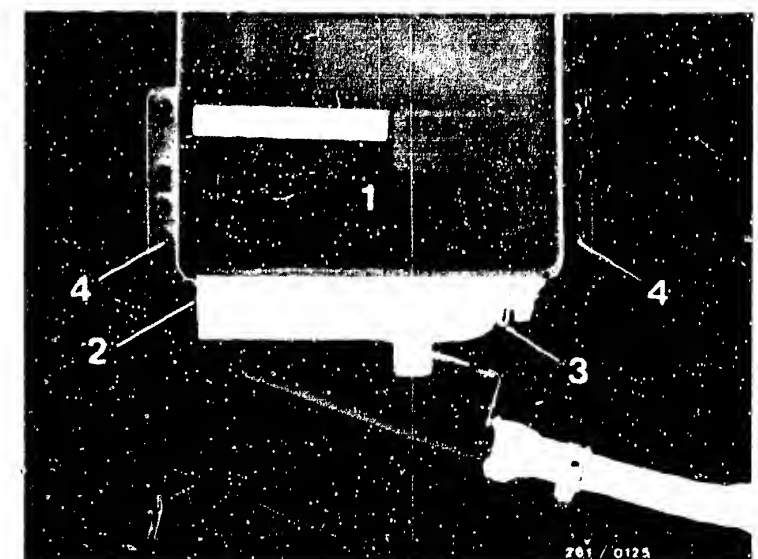
Trouble-shooting:

- Check Motronic ground terminals:
Terminals must be bare down to the metal and screws must be securely tightened.
- Check ignition coil including leads and high-tension cables.
Spring contact on control-unit plug term. 1 must not allow itself to be pushed back.
- Check lead from ignition coil term. 15 through central-electrics box A 12 (up to 1.85) or C32 (as of 1.85) to ignition lock term. 15.
- Replace control unit.



Primary signal

- 1=Control unit (as of 1.85)
2=Lug
3=Detent
4=Mounting holes



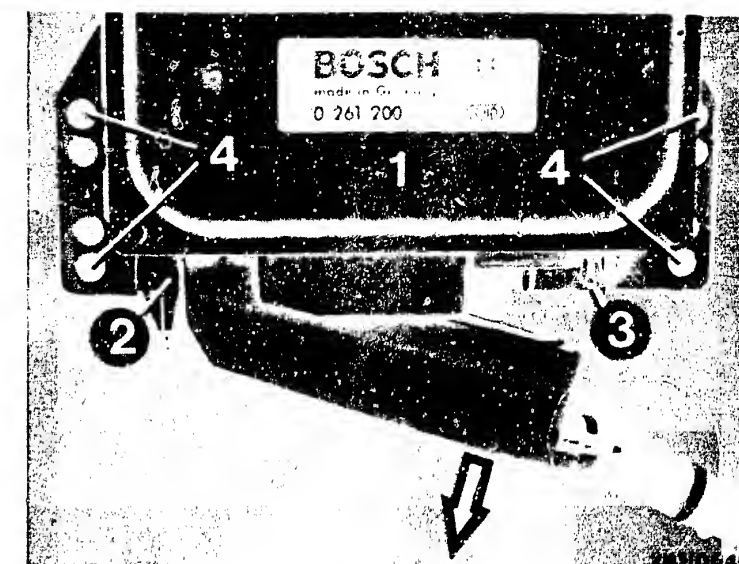
TEST STEP 23			
Operation		Reading	Testing
Program switch position "V"	8	greater than 8 V	Component: Control unit
Program switch position "Ω"	15	as of 1.85: approx. 5 V	
Measuring equipment: Voltmeter		<div><div>yes</div><div>↓</div><div>Continue testing with next test step.</div></div> <div><div>no</div><div>↓</div></div>	Operation: Supply voltage for air-flow sensor at terminal 9 and ground
Measuring range: 15 V			
Connection: Test sockets: red = +, black = ground	V		Malfunction: Voltage less than 8 V or less than approx. 5 V
Operation in vehicle: Switch on ignition			

Trouble-shooting:

- Replace control unit.

Note

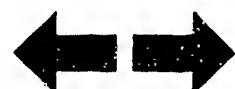
To prevent confusion between the control units of the various systems, a mechanical encoding system has been introduced. The "lug" (pivot point when opening and connecting the control unit) and the corresponding mount on the control unit have matching recesses and pins.



- 1=Control unit (up to 1.85)
- 2=Lug
- 3=Detent
- 4=Mounting holes

E23

Test with universal test adapter
Porsche 944 (USA)

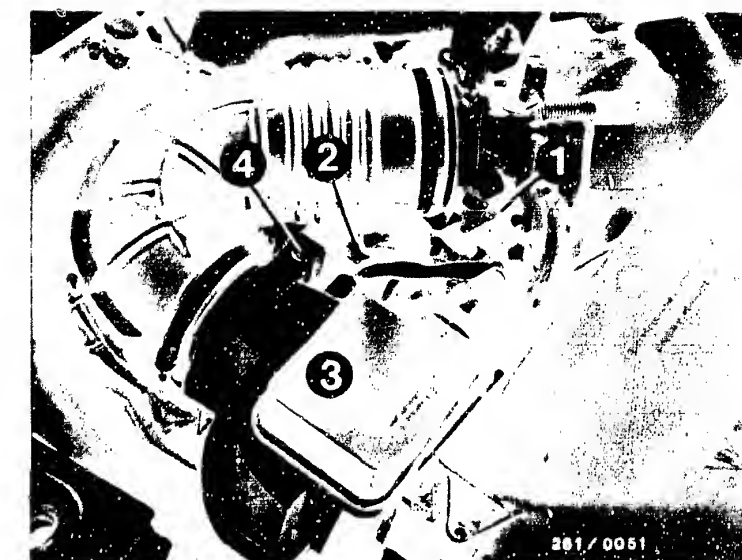


E24

Test with universal test adapter
Porsche 944 (USA)

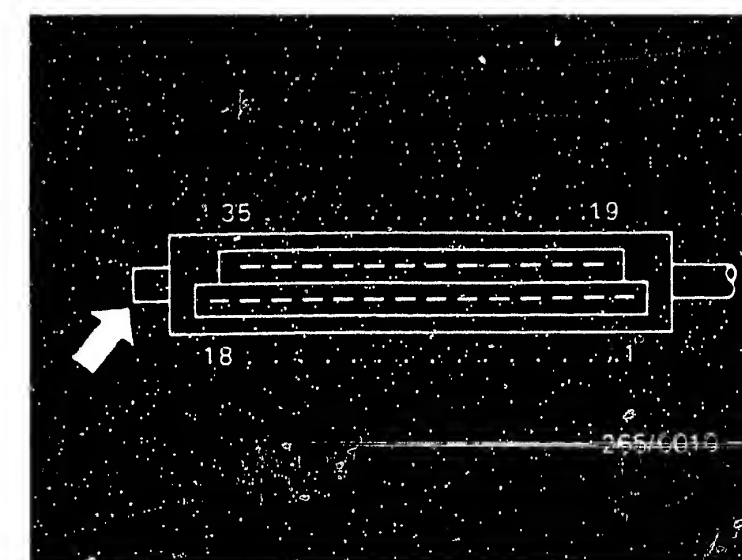


TEST STEP 24			
Operation		Reading	Testing
Program switch position "V"	9	150 ... 250 mV as of 1.85: approx. 5 V (with air-flow sensor flap closed) Loosen hose between air filter and air-flow sensor and open sensor flap by hand. Sensor flap must not catch and must return to rest position automatically when released. When sensor flap fully open, reading rises to above 7 V; as of 1.85 to above 4.5 V (change over measuring range).	Component: Air-flow sensor
Program switch position "Ω"	15		
Measuring equipment: Voltmeter			Operation: Divider voltage at terminal 7 and ground
Measuring range: 1.5 V			
Connection: Test sockets (red = +, black = ground)	V	yes ↓ Continue testing with test step 27.	Malfunction: No voltage or voltage too low
Operation in vehicle: Switch on ignition			
		no ↓	



- 1=Throttle-valve switch
 2=Engine temperature sensor (NTC II)
 3=Air-flow sensor with NTC I
 4=Idle-mixture-adjusting screw

Top view of control-unit plug (35-pin) with terminal numbers.
 Arrow="Lug" with mechanical encoding



Trouble-shooting:

No reading:

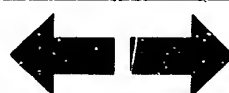
- Check leads from air-flow sensor term. 6(4), 7(2) and 9(3) to control-unit plug term. 6, 7 and 9.
- Spring contacts must not allow themselves to be pushed back.

Reading not within tolerance:

- Check whether air-flow sensor flap is closing completely.
- Replace air-flow sensor.

F1

Test with universal test adapter
 Porsche 944 (USA)

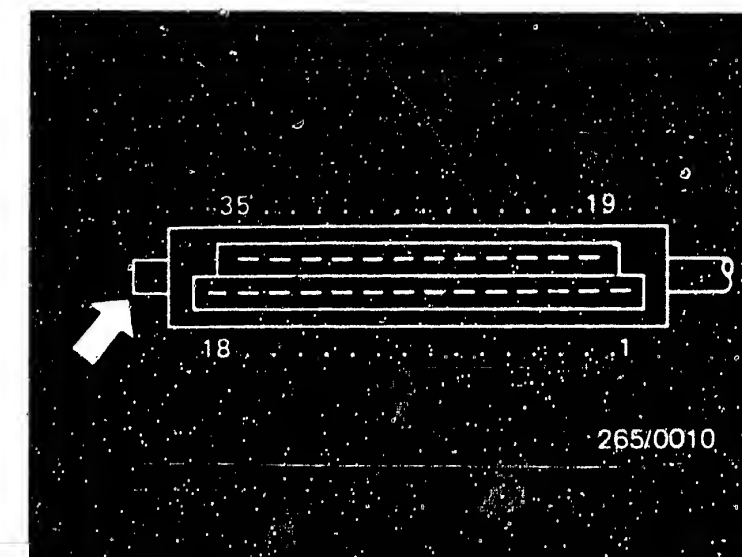


F2

Test with universal test adapter
 Porsche 944 (USA)



<u>TEST STEPS 25 and 26 not applicable</u>		
<u>TEST STEP 27</u>		
<u>Operation</u>	<u>Reading</u>	<u>Testing</u>
<u>Program switch position "V"</u> 12	<u>8 ... 15 V</u> during cranking	<u>Component:</u> Lead 4 from starting motor term. 50 to control-unit plug term. 4
<u>Program switch position "Ω"</u> 15		
<u>Measuring equipment:</u> Voltmeter	<div>yes</div> <div>no</div>	<u>Operation:</u> Voltage test at terminal 4
<u>Measuring range:</u> 15 V		
<u>Connection: Test sockets (red = +, black = ground)</u> V		<u>Malfunction:</u> Voltage less than 8 V
<u>Operation in vehicle:</u> Shift gear to neutral and start		
<u>Continue testing with next test step.</u>		



Top view of control-unit plug (35-pin) with terminal numbers
Arrow="Lug" with mechanical encoding

Trouble-shooting:

1. Voltage less than 8 V:

- Check voltage drop across starting motor terminal 50.
- Check lead from control-unit plug terminal 4 to starting motor terminal 50.

F3

Test with universal test adapter
Porsche 944 (USA)



F4

Test with universal test adapter
Porsche 944 (USA)



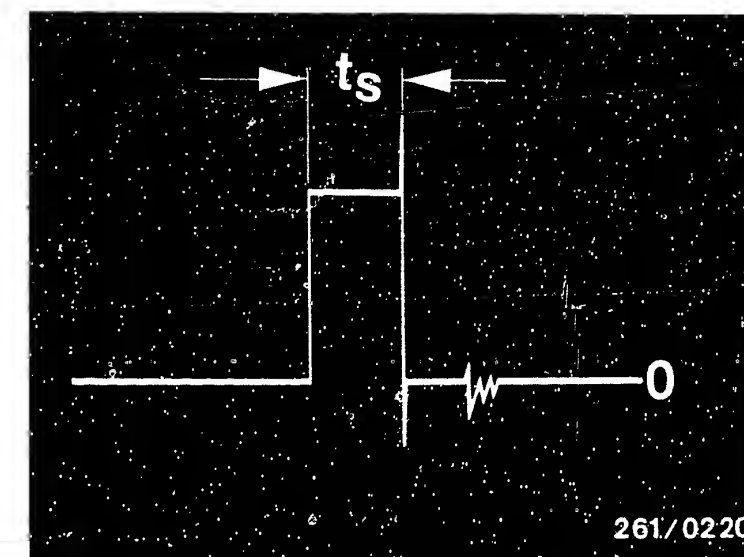
TEST STEP 28			
Operation		Reading	Testing
Program switch position "V"	13	Dwell-period signal (see top diagram)	Component Control unit
Program switch position "Ω"	15		
Measuring equipment: Motortester, oscilloscope		<div> <div>yes</div> <div>no</div> </div>	Operation: Dwell-period signal at terminal 21 and ground Malfunction: No signal
Measuring range: Special input			
Connection: Test wells; red clip to red well, black clip to black well			
Operation in vehicle: Shift gear to neutral and start			
		Continue testing with next test step	

Trouble-shooting:

- Replace control unit.

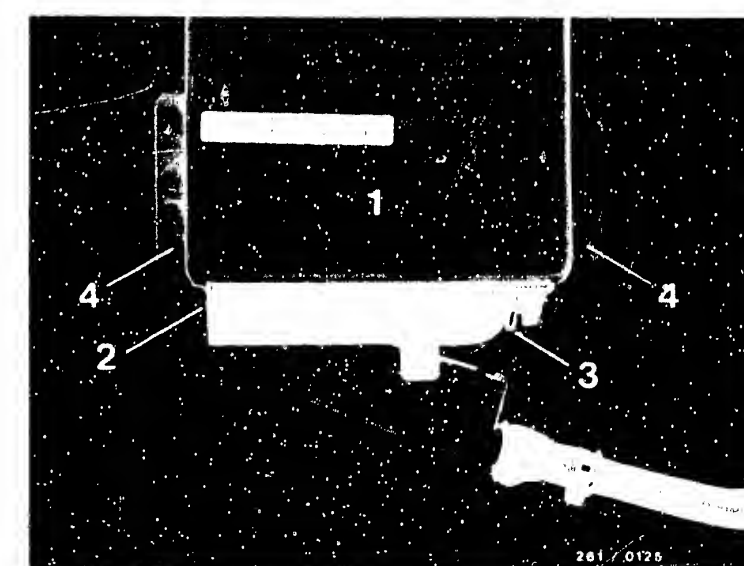
Note

To prevent confusion between the control units of the various systems, a mechanical encoding system has been introduced. The "lug" (pivot point when opening and connecting the control unit) and the corresponding mount on the control unit have mating recesses and pins.



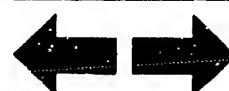
t_s = Dwell period
 0^s = Base line

1=Control unit (as of 1.85)
 2=Lug
 3=Detent
 4=Mounting holes



F5

Test with universal test adapter
 Porsche 944 (USA)



F6

Test with universal test adapter
 Porsche 944 (USA)



TEST STEP 29			
Operation		Reading	Testing
<u>Program switch position "V"</u>	14	Injection signal at solenoid-operated injection valve (see top diagram)	<u>Component:</u> Power supply for solenoid-operated injection valves, control unit
<u>Position switch position "Ω"</u>	15		
<u>Measuring equipment:</u> Motortester, oscilloscope		<div><div>yes</div><div>↓</div><div>Continue testing with next test step</div></div> <div>no</div> <div>↓</div>	<u>Operation:</u> Injection output stage at terminal 14 and ground
<u>Measuring range:</u> Special input			<u>Malfunction:</u> No signal
<u>Connection:</u> Test wells; red clip to red well, black clip to black well			
<u>Operation in vehicle:</u> Shift gear to neutral and start			

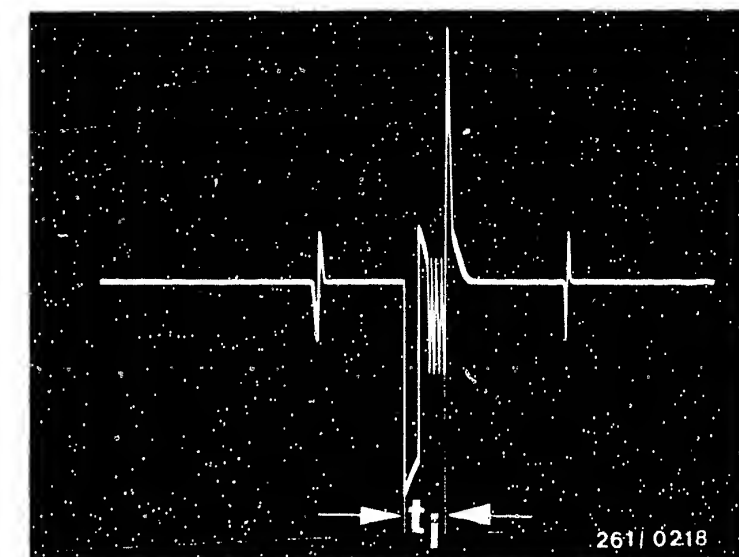
Trouble-shooting:

- Power supply to solenoid-operated injection valves:
Remove connectors from all injection valves and measure voltage to ground at both terminals. The battery voltage must be measured at each injection-valve connector. If no voltage, check leads through plug-in connection term. 2 to relay set term. 87.
- Check lead from control-unit plug term. 14 to the injection valves of cylinders 3 and 4.
- Replace control unit.

Note:

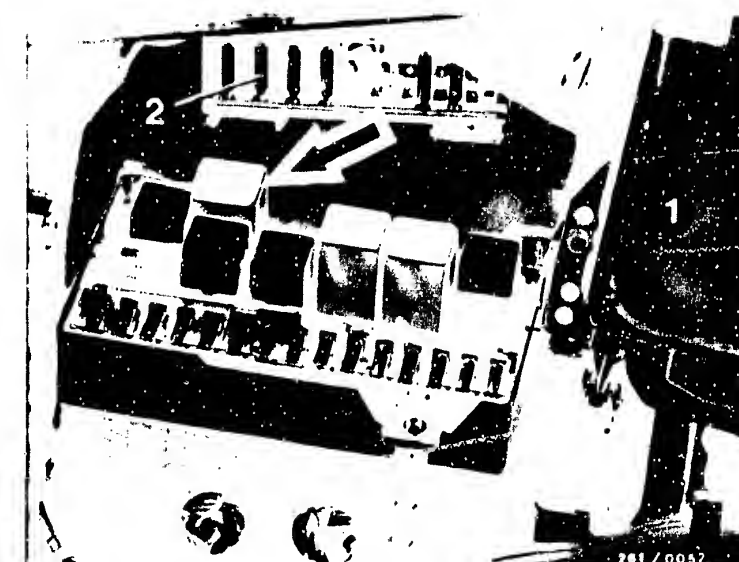
To prevent confusion between the control units of the various systems, a mechanical encoding system has been introduced. The "lug" (pivot point when opening and connecting the control unit) and the corresponding mount on the control unit have mating recesses and pins.

Continued on F9



Injection signal (at injection valve)
 t_i = Duration of injection

up to 1.85:
 Arrow=Relay set
 1=Control unit
 2=Pump fuse



F7

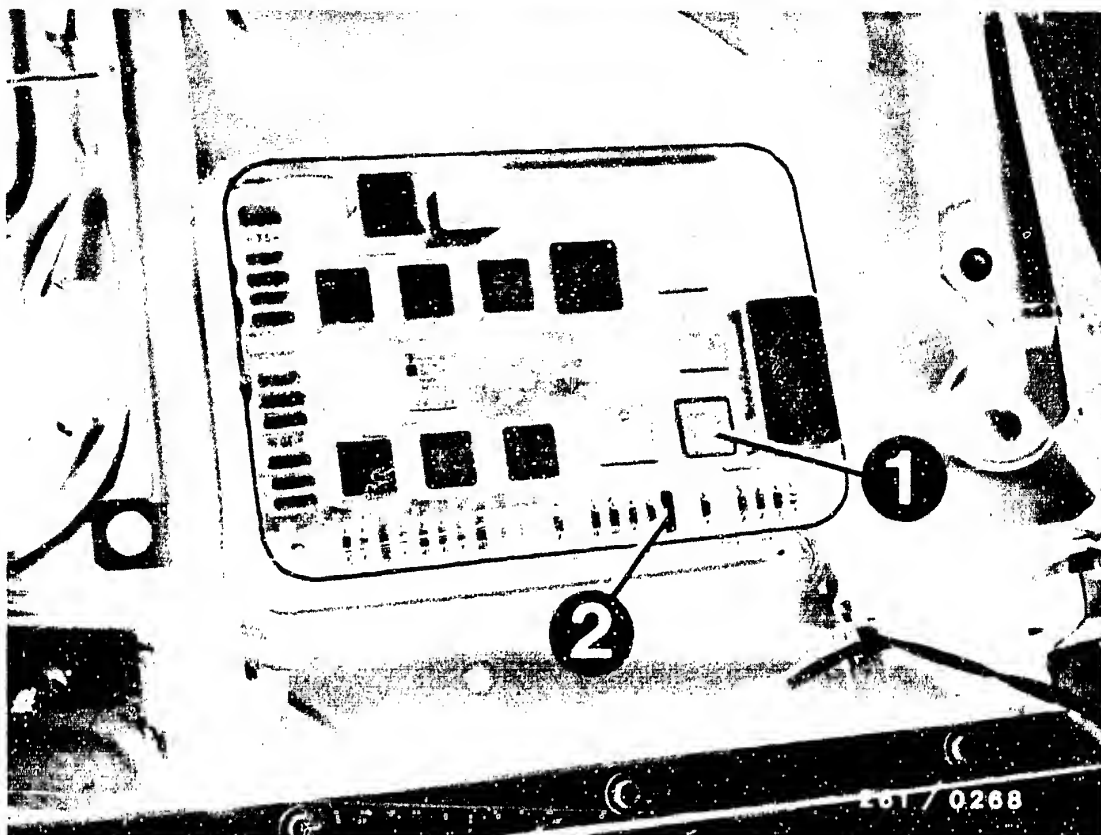
Test with universal test adapter
 Porsche 944 (USA)



F8

Test with universal test adapter
 Porsche 944 (USA)





Trouble-shooting - Test step 29 (continued)

As of 1.85:

- 1 = Relay set G5
- 2 = Pump fuse No. 34

F9

Test with universal test adapter
Porsche 944 (USA)



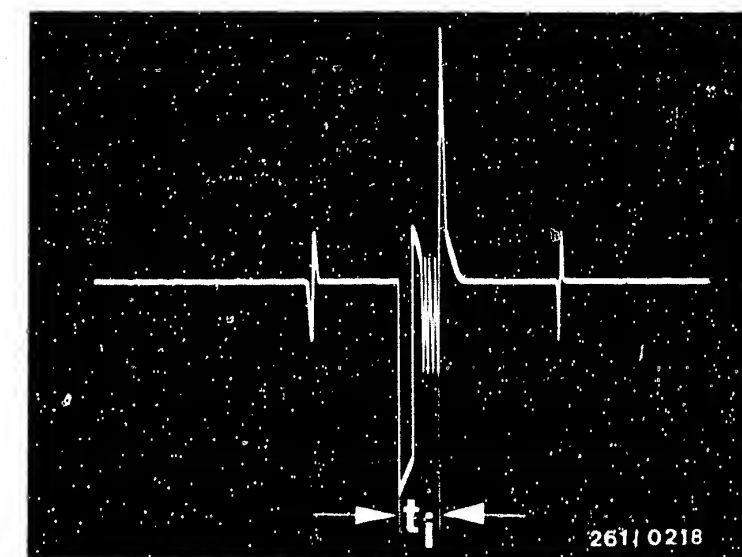
TEST STEP 30			
Operation		Reading	Testing
Program switch position "V"	14	Injection signal (see top diagram)	Component: Control unit
Position switch position "Ω"	15	After pressing button T1 (NTC II, cold) duration of injection t_i becomes slightly longer	
Measuring equipment: Motortester, oscilloscope		Press T1 only briefly, otherwise engine is over-enriched.	Operation: Influence of temperature
Measuring range: Special input			
Connection: Test wells; red clip to red well, black clip to black well		yes	Malfunction: Signal does not become wider after T1 has been pressed
Operation in vehicle: Shift gear to neutral and start		no	
Button Press T1		Continue testing with next test step	

Trouble-shooting:

- Replace control unit.

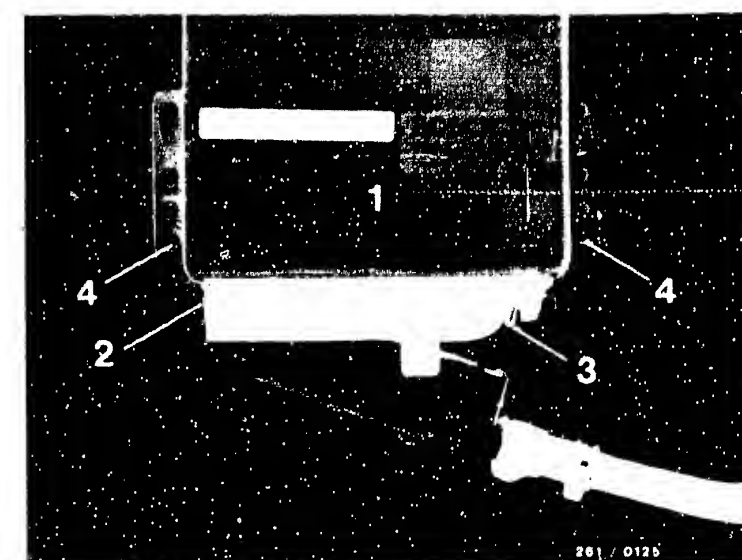
Note

To prevent confusion between the control units of the various systems, a mechanical encoding system has been introduced. The "lug" (pivot point when opening and connecting the control unit) and the corresponding mount on the control unit have mating recesses and pins.



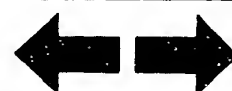
Injection signal
 t_i = Duration of injection

- 1=Control unit (as of 1.85)
- 2=Lug
- 3=Detent
- 4=Mounting holes



F10

Test with universal test adapter
Porsche 944 (USA)



F11

Test with universal test adapter
Porsche 944 (USA)



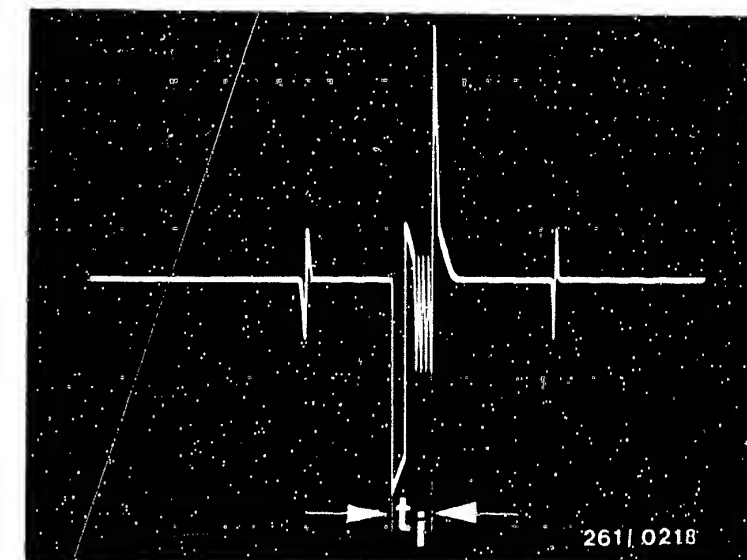
TEST STEP 31			
Operation		Reading	Testing
Program switch position "V"	15	Injection signal at solenoid-operated injection valve (see top diagram)	<u>Component:</u> Control unit
Position switch position "Ω"	15		
Measuring equipment: Motortester, oscilloscope		<div> <div>yes</div> <div>no</div> </div>	<u>Operation:</u> Injection output stage at terminal 15 and ground
Measuring range: Special input			<u>Malfunction:</u> No signal
Connection: Test wells; red clip to red well, black clip to black well			
Operation in vehicle: Shift gear to neutral and start			
		Continue testing with next test step	

Trouble-shooting:

- Power supply to solenoid-operated injection valves:
Remove connectors from all injection valves and measure voltage to ground at both terminals. The battery voltage must be measured at each injection-valve connector. If no voltage, check lead through plug-in connection term. 2 to relay set term. 87.
- Check lead from control-unit plug term. 15 to the injection valves of cylinders 1 and 2.
- Replace control unit.

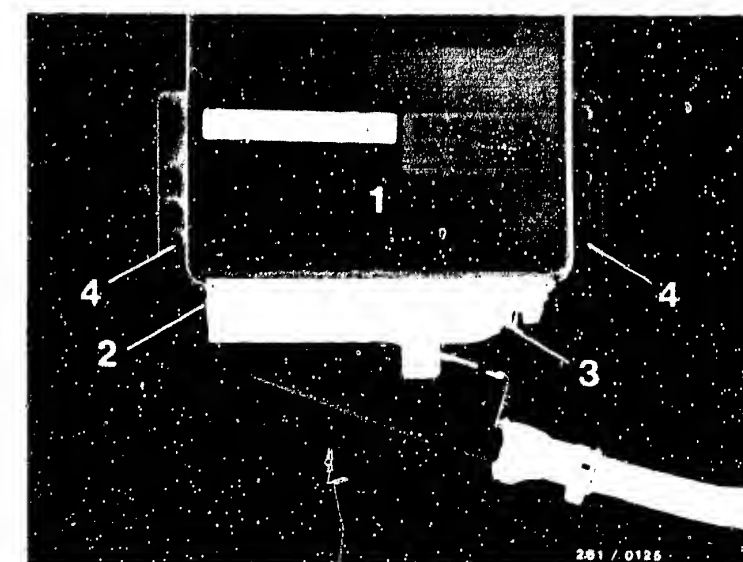
Note:

To prevent confusion between the control units of the various systems, a mechanical encoding system has been introduced. The "lug" (pivot point when opening and connecting the control unit) and the corresponding mount on the control unit have mating recesses and pins.



Injection signal
 t_i = Duration of injection

- 1=Control unit (as of 1.85)
- 2=Lug
- 3=Detent
- 4=Mounting holes



F12

Test with universal test adapter
Porsche 944 (USA)



F13

Test with universal test adapter
Porsche 944 (USA)



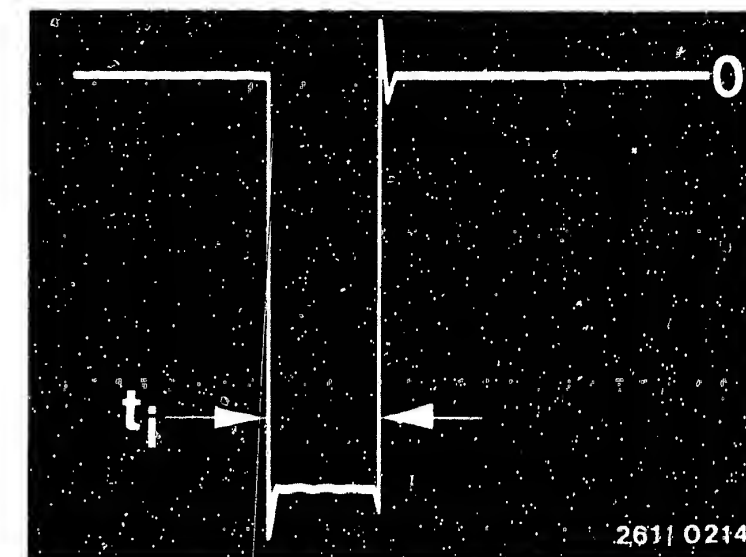
TEST STEP 32			
Operation		Reading	Testing
Program switch position "V"	16	Injection signal at solenoid operated injection valve (see top diagram)	Component: Control unit
Position switch position "Ω"	15		
Measuring equipment: Motortester, oscilloscope		yes	Operation: Injection signal at terminal 11 and ground
Measuring range: Special input		no	
Connection: Test wells; red clip to red well, black clip to black well		Continue testing with next test step	Malfunction: No signal
Operation in vehicle: Shift gear to neutral and start			

Trouble-shooting:

- Replace control unit.

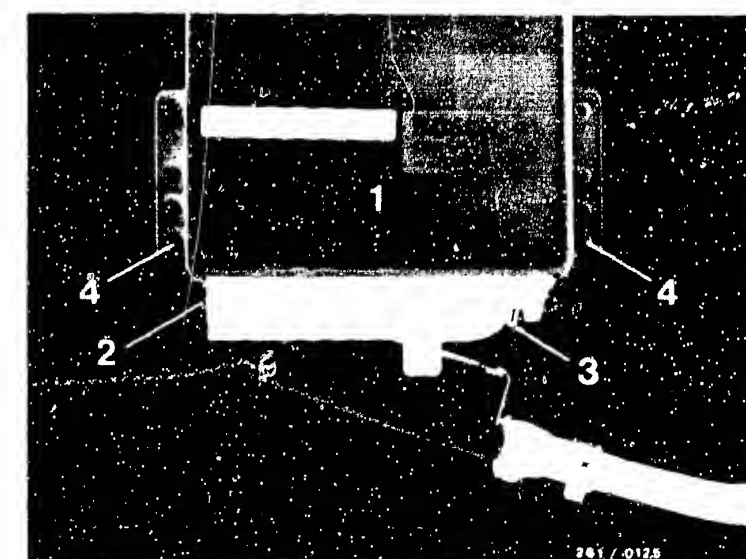
Note

To prevent confusion between the control units of the various systems, a mechanical encoding system has been introduced. The "lug" (pivot point when opening and connecting the control unit) and the corresponding mount on the control unit have mating recesses and pins.



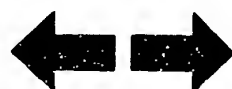
Injection signal
 t_i = Duration of injection
 0 = Base line

1=Control unit (as of 1.85)
 2=Lug
 3=Detent
 4=Mounting holes



F14

Test with universal test adapter
 Porsche 944 (USA)



F15

Test with universal test adapter
 Porsche 944 (USA)



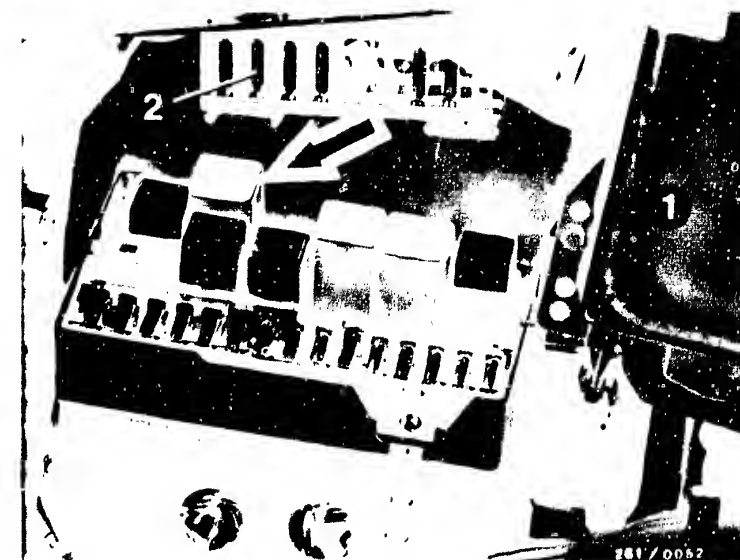
TEST STEP 33			
Operation		Reading	Testing
Program switch position "V"	17	10 ... 15 V	Component: Relay set (pump relay)
Program switch position "Ω"	15		
Measuring equipment: Voltmeter		yes	Operation: Voltage at term. 20 to ground
Measuring range: 15 V		no	
Connection: Test sockets; (red = +, black = ground)	V	Continue testing with next test step	Malfunction: Voltage less than 10 V
Operation in vehicle: Ignition on			

Trouble-shooting:

- Replace relay set
- Check lead from control-unit plug term. 20 through plug-in connection term. 5 to relay set term. 85b.
- Replace control unit.

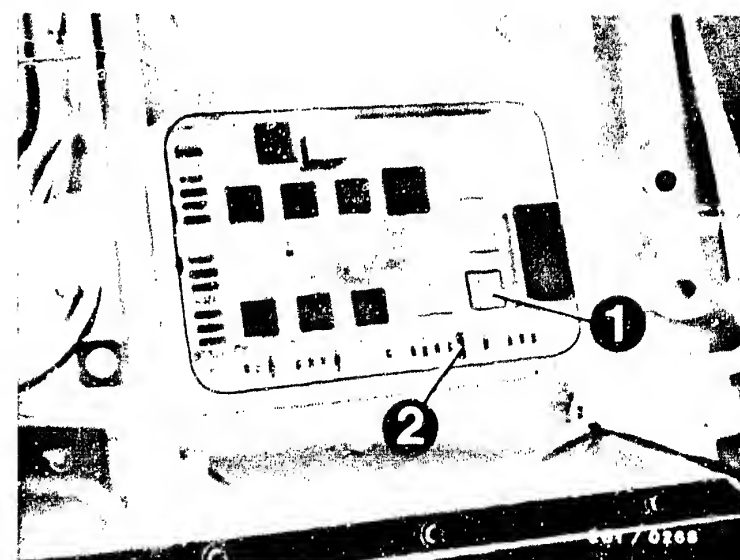
Note:

To prevent confusion between the control units of the various systems, a mechanical encoding system has been introduced. The "lug" (pivot point when opening and connecting the control unit) and the corresponding mount on the control unit have mating recesses and pins.



up to 1.85:
 Arrow=Relay set
 1=Control unit
 2=Pump fuse

as of 1.85:
 1=Relay set G5
 2=Pump fuse No. 34



F16

Test with universal test adapter
 Porsche 944 (USA)



F17

Test with universal test adapter
 Porsche 944 (USA)



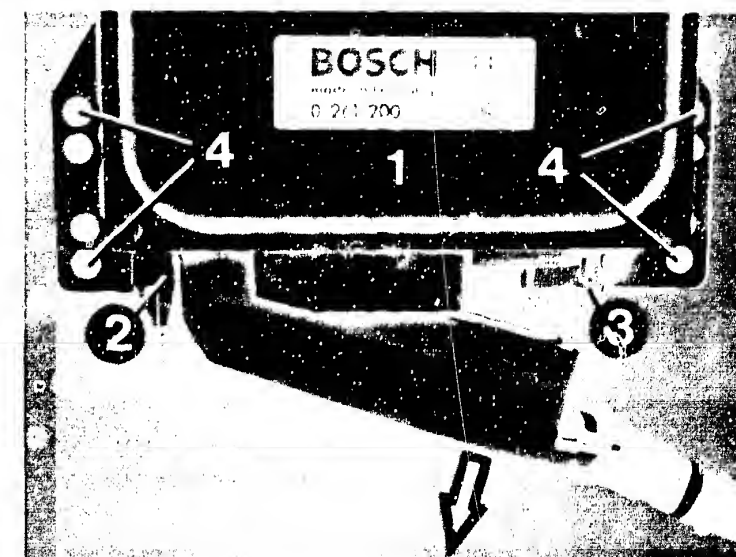
TEST STEP 34			
Operation		Reading	Testing
Program switch position "V"	17	max. 4 V	Component: Control unit
Program switch position "Ω"	15		
Measuring equipment: Voltmeter		<div> <div>yes</div> <div>no</div> </div>	<div> <div>Operation: Pump control term. 20 to ground</div> <div>Malfuction: Votager greater than 4 V</div> </div>
Measuring range: 15 V			
Connection: Test sockets; (red = +, black = ground)	V		
Operation in vehicle: Shift gear to neutral and start			

Trouble-shooting:

- Replace control unit.

Note:

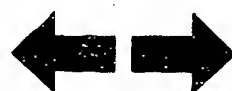
To prevent confusion between the control units of the various systems, a mechanical encoding system has been introduced. The "lug" (pivot point when opening and connecting the control unit) and the corresponding mount on the control unit have mating recesses and pins.



- 1=Control unit (up to 1.85)
- 2=Lug
- 3=Detent
- 4=Mounting holes

F18

Test with universal test adapter
Porsche 944 (USA)


F19

Test with universal test adapter
Porsche 944 (USA)

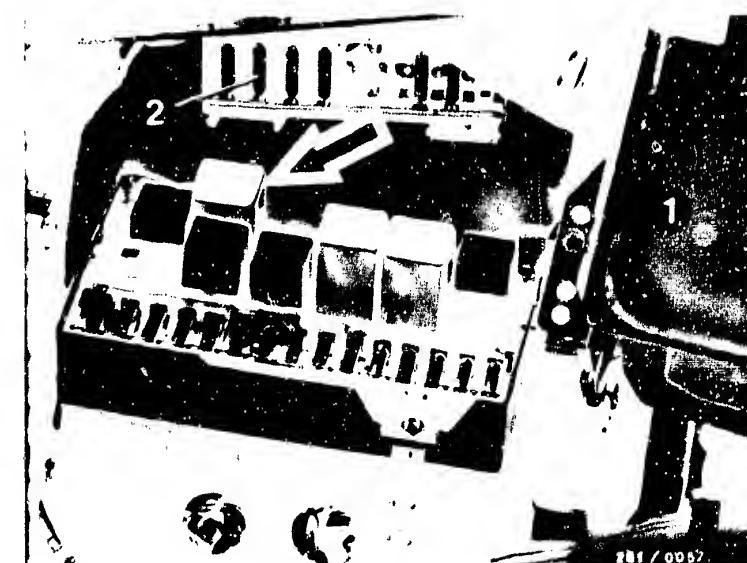


TEST STEP 35 Switch off ignition, connect pressure gauge.			
Operation		Reading	Testing
<u>Program switch position "V"</u>	17	<u>2.3 to 2.7 bar</u>	<u>Component:</u> Pump relay, fuel pump, pressure regulator
<u>Program switch position "Ω"</u>	15		
<u>Measuring equipment:</u> Pressure gauge		<div><div>yes</div><div>no</div><div>↓ Continue testing with next test step</div></div>	<u>Operation:</u> Fuel pressure
<u>Measuring range:</u> 0 to 6 bar			
<u>Connection:</u> At test connection			
<u>Operation in vehicle:</u> Switch on ignition			
<u>Button:</u> Press T3			
			<u>Malfunction:</u> No fuel pressure or pressure not within tolerance



1=Test connection
2=Pressure gauge

up to 1.85:
Arrow=Relay set
1=Control unit
2=Pump fuse



Note:

Install pressure gauge (2) at test connection (1) on fuel-distribution pipe. Watch for the built-in ball when opening the cap nut. Catch any escaping gasoline. Fire hazard if engine hot and electric sparks.

Continued on F22

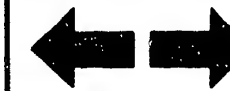
F20

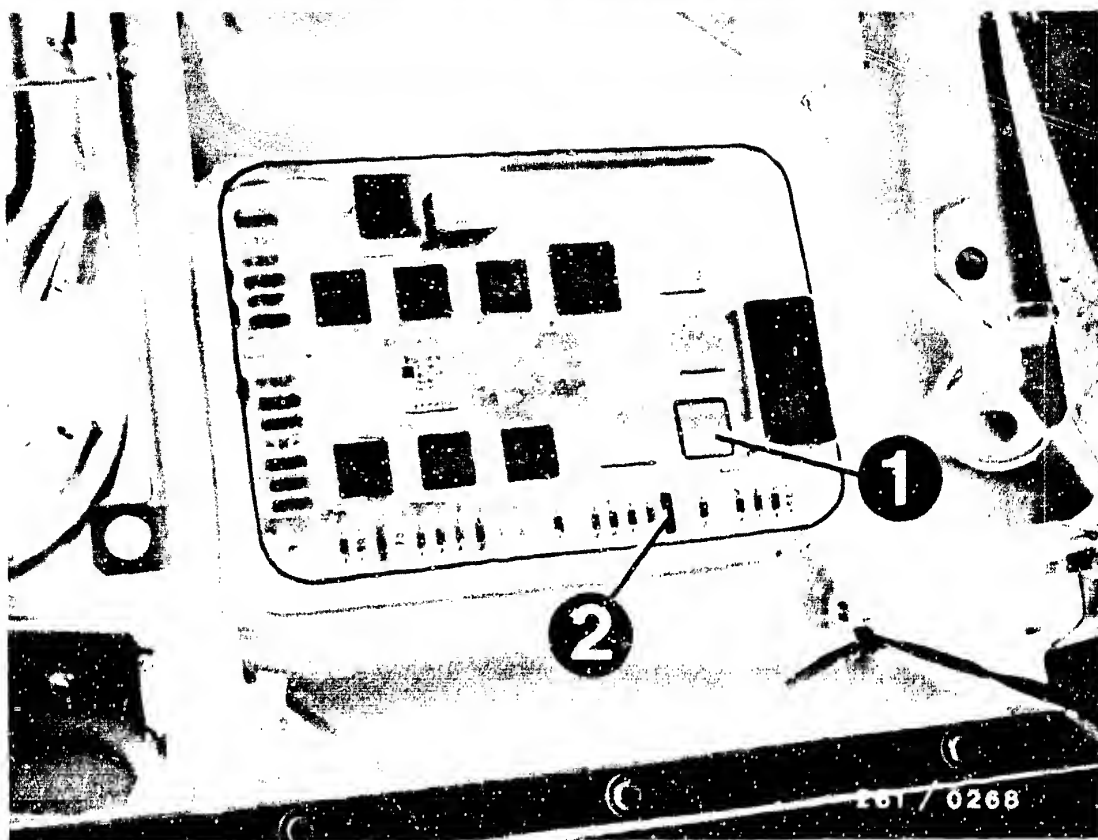
Test with universal test adapter
Porsche 944 (USA)



F21

Test with universal test adapter
Porsche 944 (USA)





Trouble-shooting - Test step 35 (continued)

As of 1.85:

- 1 = Relay set G5
- 2 = Pump fuse No. 34

Continued on F23/F24

Trouble-shooting - Test step 35 (continued)

1. Pressure 0 bar, no pump noises can be heard:

- Check pump fuse.
- Replace relay set.
- Measure voltage at disconnected pump plug.

No voltage:

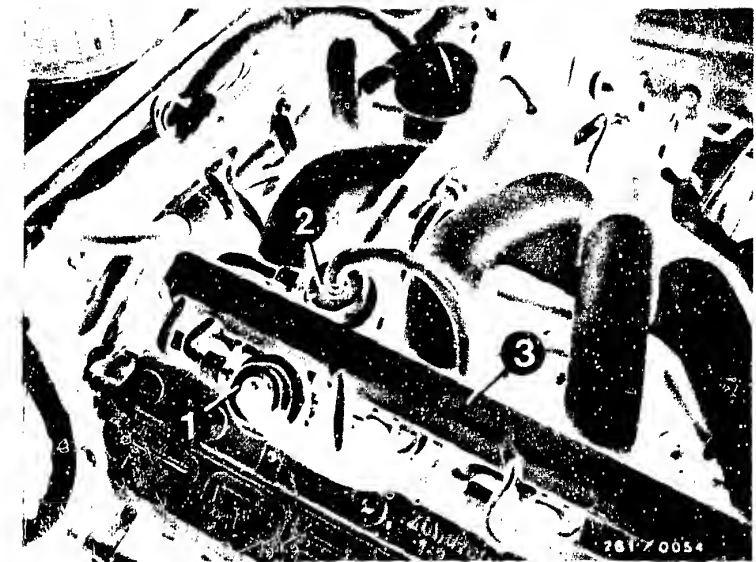
Check lead from electric fuel pump to relay set term. 87b as well as pump ground lead.

- Voltage present:
Check pressure regulator and electric fuel pump, as described below under 2.

2. Pressure not within tolerance, electric fuel pump operating:

- Fuel pressure too low:
Slowly pinch off return line with hose clammer. Pressure rises above 4 bar - replace pressure regulator.
Pressure remains below 4 bar - replace electric fuel pump.

Continued on G1/G2



up to 1.85:

1=Pressure regulator

2=Pressure damper

3=Fuel-distribution pipe

4=Air hose to intake manifold

5=Return hose

up to 1.85:

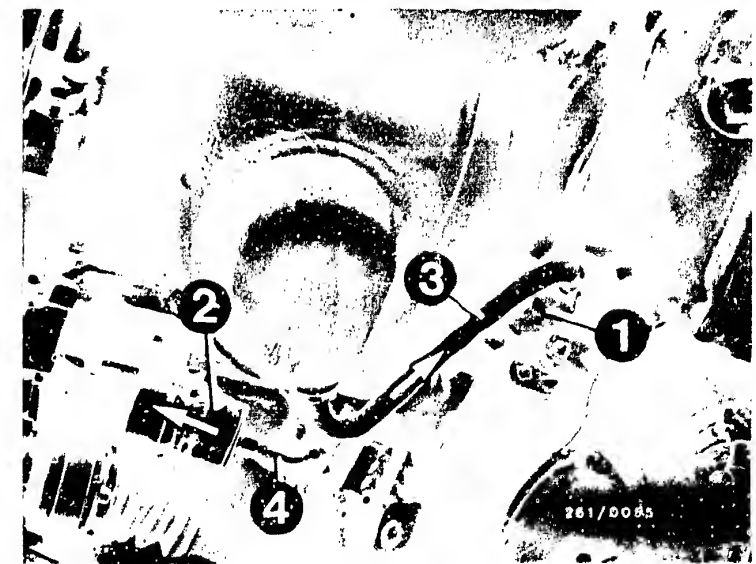
1=Electric fuel pump

2=Fuel filter

3=Fuel intake line

4=Fuel delivery line

Arrows=Direction of flow



F23

Test with universal test adapter
Porsche 944 (USA)



F24

Test with universal test adapter
Porsche 944 (USA)



Trouble-shooting - Test step 35 (continued)

- Check fuel line and fuel filter for throughflow. Fuel lines pinched?
- Strainer in tank clogged?
- Corrosion in tank?

3. Fuel pressure above 2.7 bar:

- Fuel return line clogged or pinched.
- Replace pressure regulator.

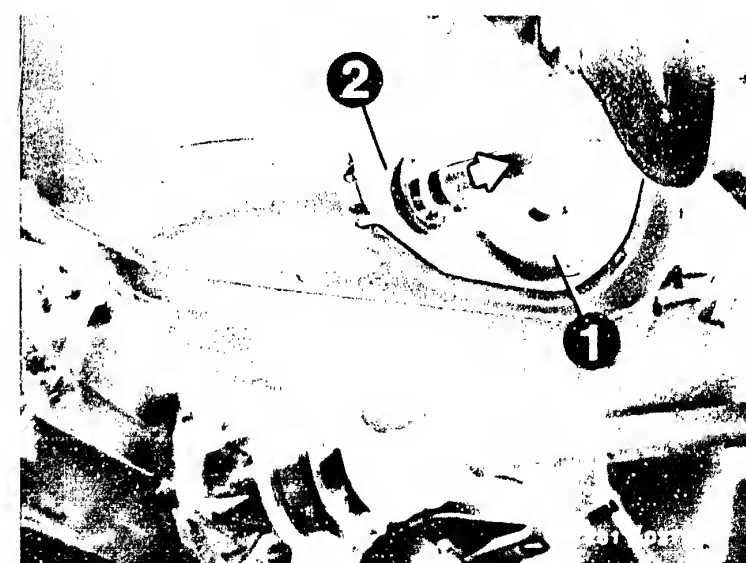


as of 1.85:

- 1=Pressure regulator
- 2=Pressure damper
- 3=Fuel-distribution pipe
- 4=Fuel delivery line
- 5=Return hose

as of 1.85:

- 1=Electric fuel pump
- 2=Fuel filter
- Arrow=Direction of flow



G1

Test with universal test adapter
Porsche 944 (USA)



G2

Test with universal test adapter
Porsche 944 (USA)



CAUTION:

The following test steps can only be performed if the engine is running. If engine not running, continue with the trouble-shooting program of your choice.

Detailed trouble-shooting - see C3 - C4

Direct trouble-shooting - see C5 - C10

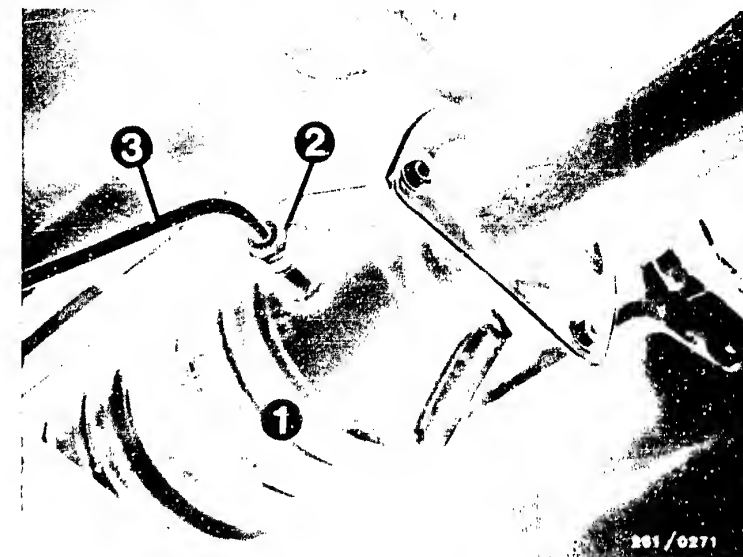
For further trouble-shooting, test adapter, control unit and pressure gauge remain connected.

TEST STEP 36 Connect motortester and CO analyzer to test connection before catalytic converter. The lambda sensor is open-circuited by the test adapter.

<u>Operation</u>		<u>Reading</u>	<u>Testing</u>
<u>Program switch position "V"</u>	17	Keep to sequence. First measure CO. Conditions: Engine at op. temp., electric loads off, ambient temperature $+15^{\circ}\text{C} \dots +35^{\circ}\text{C}$ CO value: $0.4 \dots 0.8 \text{ vol.}\% \text{CO}^*$ Idle speed: $850 \dots 950 \text{ min}^{-1}$ As of 1.85: For checking and adjusting the idle speed, the idle-speed control must be off: On test socket, connect term. B and term. C with lead. Idle speed: $800 \dots 880 \text{ min}^{-1}$	<u>Component:</u> Engine, leak-tightness of air-intake system
<u>Program switch position "Ω"</u>	15		
<u>Measuring equipment:</u> Motortester and CO analyzer			<u>Operation:</u> Idle speed and exhaust
<u>Measuring range:</u> Engine speed and CO			
<u>Connection:</u> Ignition coil, exhaust			<u>Malfunction:</u> Readings not within tolerance
<u>Operation in vehicle:</u> Let engine run at normal op. temp.			

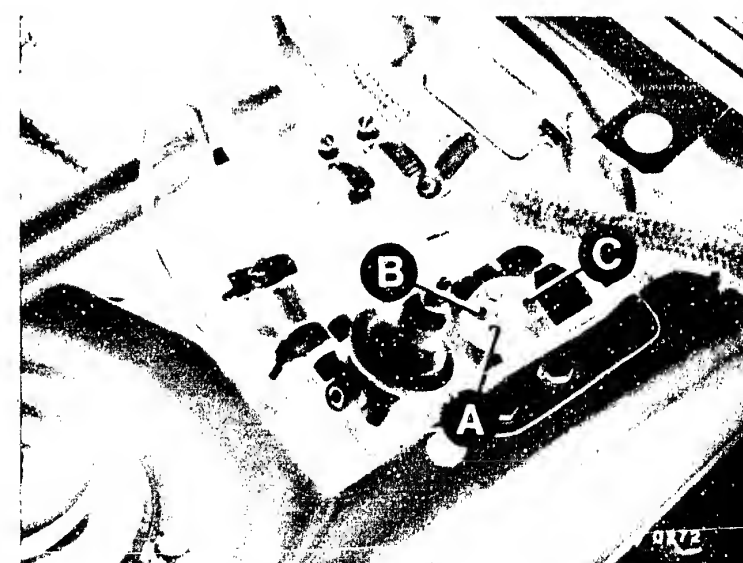
*) Perform adjusting operations as quickly as possible so that the intake passages do not overheat, thus causing the CO reading to be incorrect. The intake air must be between $+15^{\circ}\text{C}$ and $+35^{\circ}\text{C}$ in order to guarantee correct adjustment. Press button T2. The CO reading must not change. If reading changes, engine is not yet at normal operating temperature.

Continued on G5/G6



1=Catalytic converter
2=Test connection
3=Exhaust test pipe

A,B,C=Terminals of test socket



G3

Test with universal test adapter
Porsche 944 (USA)



G4

Test with universal test adapter
Porsche 944 (USA)



Trouble-shooting - Test step 36 (continued)

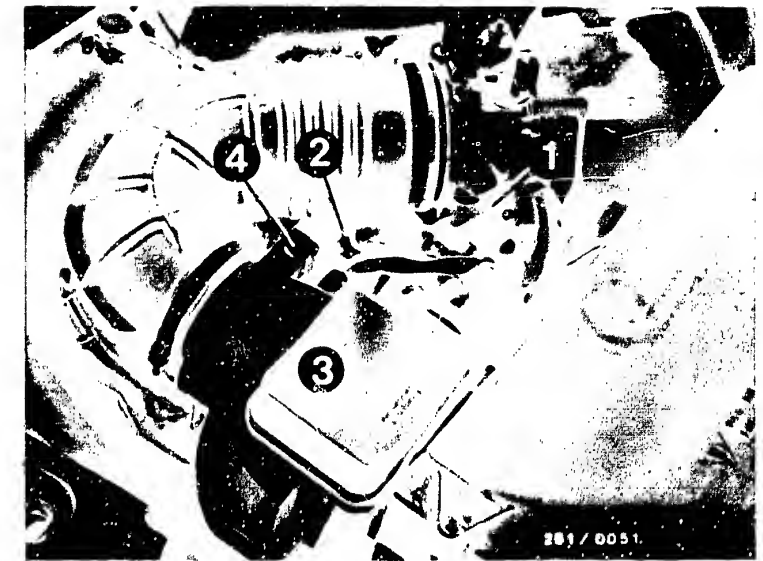
- Adjust exhaust gas with idle-mixture-adjusting screw in air-flow sensor. To do this, remove plug in air-flow sensor using special tool. After adjusting, use new plug.

Turning idle-mixture-adjusting screw to the right: CO concentration increases.
Turning idle-mixture-adjusting screw to the left: CO concentration decreases.

If exhaust concentration less than 0.4 vol.%CO and not adjustable:
Check intake side and exhaust system for leaks (unmetered air) by means of pressure test.

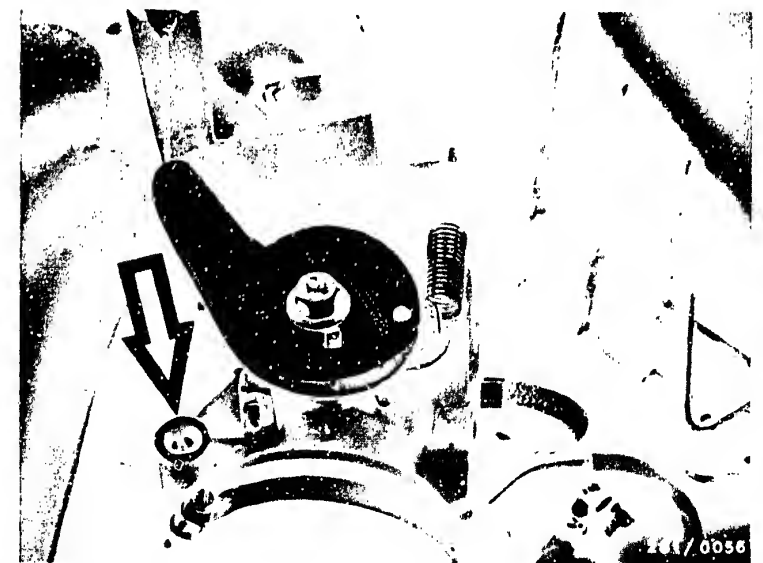
After CO measurement is completed, coat the thread at the CO connection with grease VS 14016 and tighten the cap nut to 30 Nm (22 ft lb).

- Adjust idle speed at idle-speed adjusting screw in throttle-valve assembly.



- 1=Throttle-valve switch
2=Engine temperature sensor (NTC II)
3=Air-flow sensor with NTC I
4=Idle-mixture-adjusting screw

Arrow=Idle-speed adjusting screw



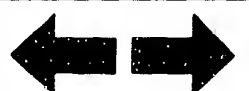
G5

Test with universal test adapter
Porsche 944 (USA)



G6

Test with universal test adapter
Porsche 944 (USA)



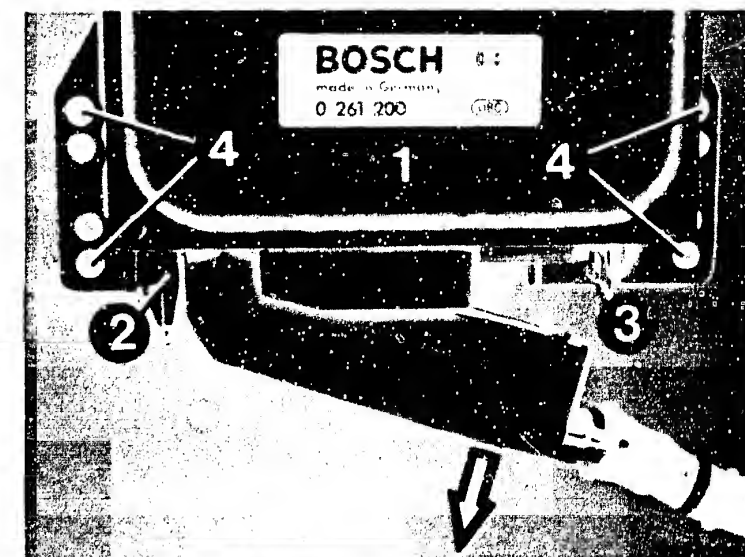
TEST STEP 37			
Operation		Reading	Testing
Program switch position "V"	17	1. Spark advance with engine at op. temp. and at idle speed: $0^{\circ} \dots 10^{\circ}$ 2. Press button T6 (full load) and raise engine speed to 2400 min^{-1} : spark advance $11^{\circ} \dots 21^{\circ}$	Component: Control unit
Program switch position "Ω"	15		
Measuring equipment: Motortester			Operation: Spark advance at idle and full load.
Measuring range: Spark advance			Malfunction: Spark advance not within tolerance
Connection: Timing light			
Operation in vehicle: Let engine run at normal op. temp.		yes ↓ Continue testing with next test step	no ↓

Trouble-shooting:

- 1.: Check idle speed again precisely and repeat test step. Idle speed must be between 850 and 950 min^{-1} (as of 1.85 between 800 and 880 min^{-1}). Otherwise, different spark advance angles are indicated.
- 2.: Raise engine speed once again to the stated speed and read off spark advance angle again.
- Replace control unit.

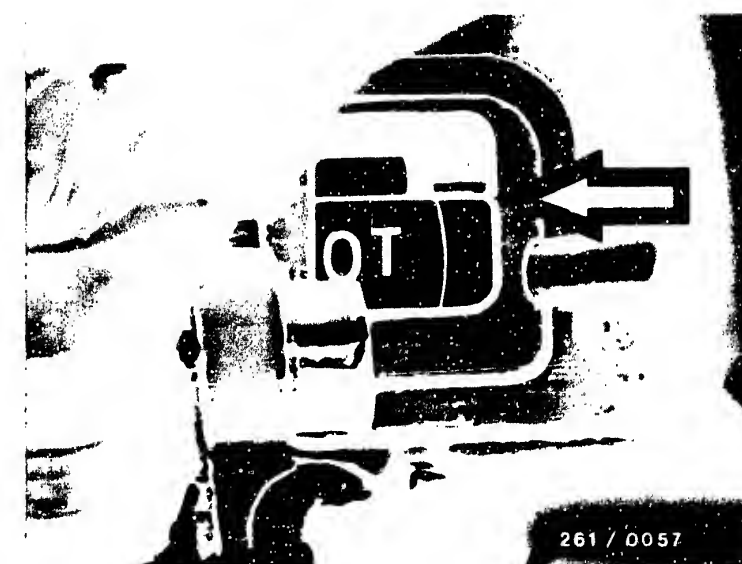
Note:

To prevent confusion between the control units of the different systems, a mechanical encoding system has been introduced. The "lug" (pivot point when opening and connecting the control unit) and the corresponding mount on the control unit have mating recesses and pins.



- 1=Control unit (up to 1.85)
 2=Lug
 3=Detent
 4=Mounting holes

TDC mark on flywheel and projection on clutch housing must align.



G7

Test with universal test adapter
Porsche 944 (USA)

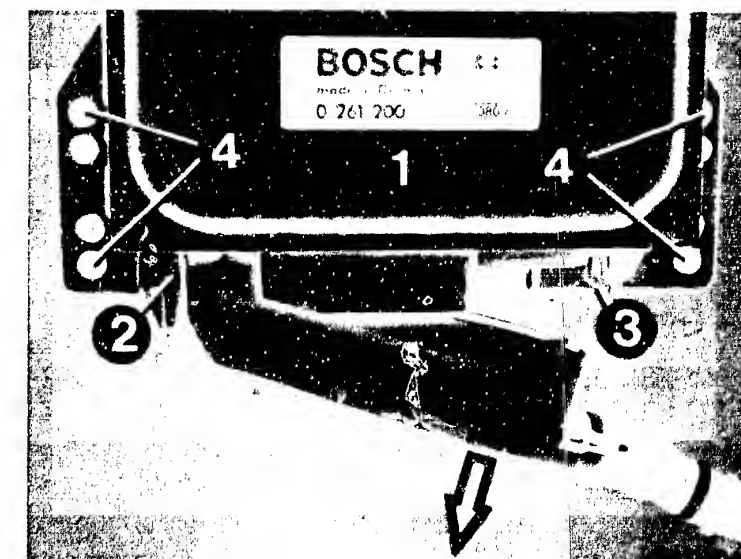


G8

Test with universal test adapter
Porsche 944 (USA)



TEST STEP 38			
Operation		Reading	Testing
Program switch position "V"	17	1. Dwell angle with engine at op. temp. and at idle speed: 8 ... 15° 2. At 3000 min ⁻¹ 30 ... 45°	Component: Control unit
Program switch position "Ω"	15		
Measuring equipment: Motortester			Operation: Dwell angle
Measuring range: Dwell angle		<div>yes</div> <div>no</div>	Malfunction: Dwell angle not within tolerance
Connection: Ignition coil			
Operation in vehicle: Let engine run			
		Continue testing with next test step	



- 1=Control unit (up to 1.85)
- 2=Lug
- 3=Detent
- 4=Mounting holes

Trouble-shooting:

- Replace control unit.

Note

To prevent confusion between the control units of the different systems, a mechanical encoding system has been introduced. The "lug" (pivot point when opening and connecting the control unit) and the corresponding mount on the control unit have mating recesses and pins.

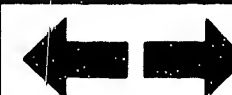
G9

Test with universal test adapter
Porsche 944 (USA)



G10

Test with universal test adapter
Porsche 944 (USA)



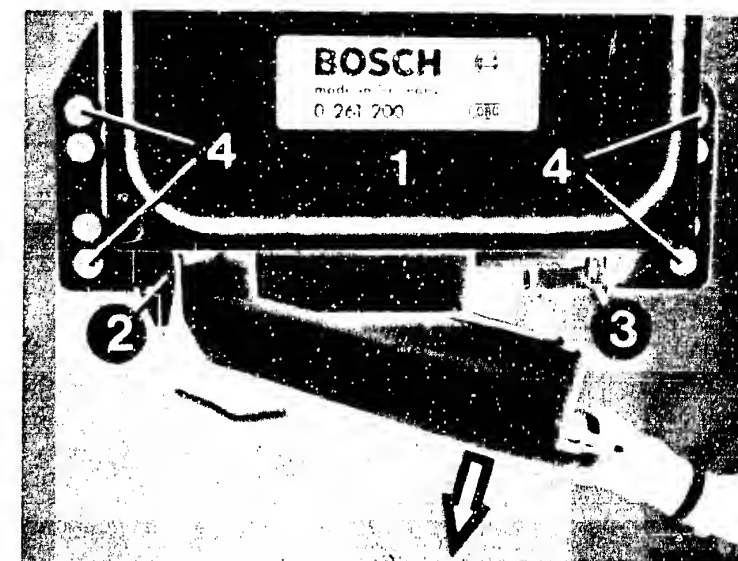
TEST STEP 39		
Operation	Reading	Testing
Program switch position "V"	17	Component: Control unit
Program switch position "Ω"	15	
Measuring equipment: Motortester	i.e. engine speed fluctuates constantly between approx. 1000 min ⁻¹ and approx. 1600 min ⁻¹	Operation: Cutting off of injection pulses (overrun cutoff)
Measuring range: Engine speed		
Connection: Ignition coil	<div>yes</div> <div>↓</div> <div>Continue testing with next test step</div>	Malfunction: No cutting off.
Operation in vehicle: Let engine run		
Button: Press T5	no	

Trouble-shooting:

- Replace control unit.

Note

To prevent confusion between the control units of the different systems, a mechanical encoding system has been introduced. The "lug" (pivot point when opening and connecting the control unit) and the corresponding mount on the control unit have mating recesses and pins.



- 1=Control unit (up to 1.85)
- 2=Lug
- 3=Detent
- 4=Mounting holes

G11

Test with universal test adapter
Porsche 944 (USA)



G12

Test with universal test adapter
Porsche 944 (USA)



TEST STEP 40 (only for vehicles as of 1.85)

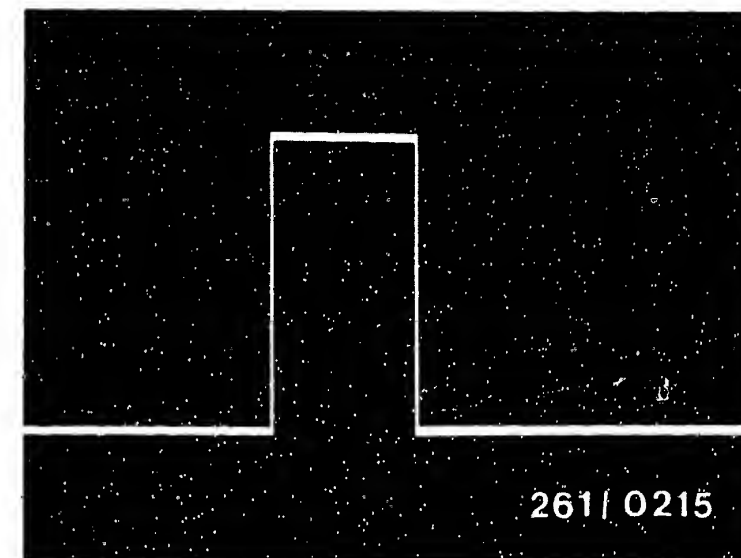
<u>Operation</u>		<u>Reading</u>	<u>Testing</u>
<u>Program switch position "V"</u>	18	1. Signals present (see top diagram) 2. On/off ratio (dwell angle) with pocket tester <u>70 % ± 5 %</u> Measurement with engine at normal operating temperature and at idle speed (idle contact closed and air conditioner off) and connect term. B and C on test socket.	<u>Component:</u> Control unit, idle actuator
<u>Program switch position "Ω"</u>	15		
<u>Measuring equipment:</u> Motortester, pocket tester			<u>Operation:</u> On/off ratio of idle-speed control between term. 33 and term. 5
<u>Measuring range:</u> Oscilloscope, dwell angle			<u>Malfunction:</u> 1. No signal 2. On/off ratio considerably different
<u>Connection:</u> Test wells; red clip to red well, black clip to black well			
<u>Operation in vehicle:</u> Let engine run			

Trouble-shooting:

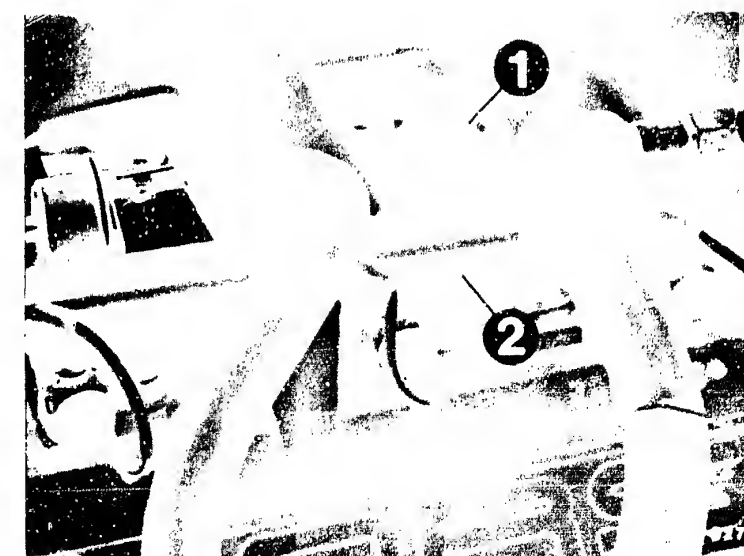
- Measure internal resistance of idle actuator:
term. 4 to term. 5: $17 \dots 19.5 \Omega$ (at $+20^{\circ}\text{C}$)
term. 4 to term. 3: $19 \dots 21.5 \Omega$ (at $+20^{\circ}\text{C}$)
If replacing the idle actuator, pay attention to its direction of flow (arrow on housing).
- Replace control unit.

Note:

To prevent confusion between the control units of the different systems, a mechanical encoding system has been introduced. The "lug" (pivot point when opening and connecting the control unit) and the corresponding mount on the control unit have mating recesses and pins.



1=Idle actuator
2=Fuel-distribution pipe



G 13

Test with universal test adapter
Porsche 944 (USA)

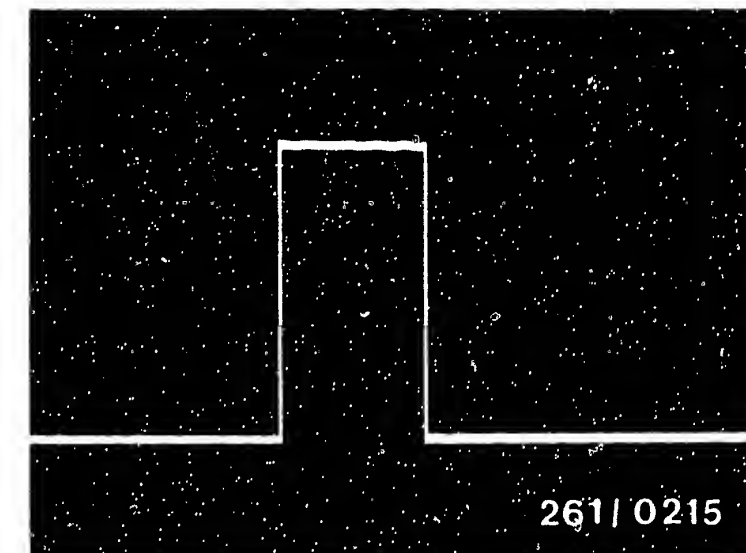


G 14

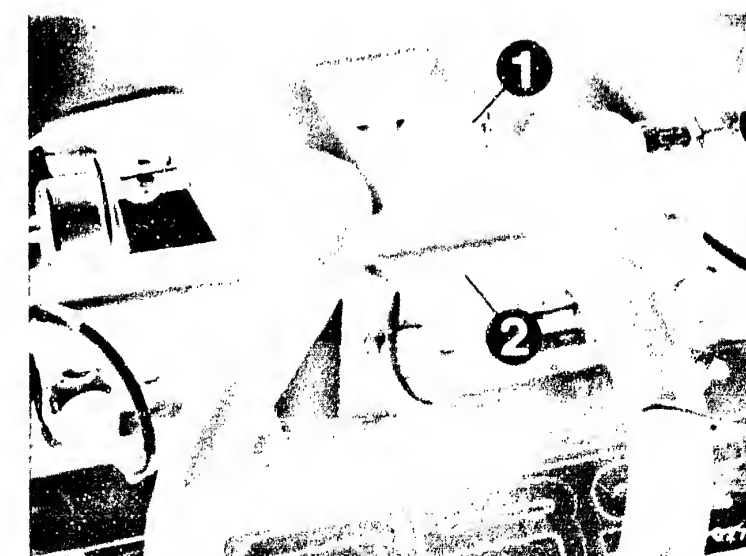
Test with universal test adapter
Porsche 944 (USA)



TEST STEP 41		Reading	Testing
Operation			
Program switch position "V"	19	1. Signals present (see top diagram) 2. On/off ratio (dwell angle) with pocket tester $30 \% \pm 5 \%$	Component: Control unit, idle actuator
Program switch position "Ω"	15		
Measuring equipment: Motortester, pocket tester		Measurement with engine at normal operating temperature and at idle speed (idle contact closed and air conditioner off) and connect term. B and C on test socket.	Operation: On/off ratio of idle-speed control between term. 34 and term. 5
Measuring range: Oscilloscope, dwell angle			
Connection: Test wells; red clip to red well, black clip to black well			Malfunction: 1. No signal 2. On/off ration considerably different
Operation in vehicle: Let engine run		<div> <div>yes</div> <div>Continue testing with next test step</div> </div> <div>no</div>	



1=Idle actuator
2=Fuel-distribution pipe



Trouble-shooting:

- Measure internal resistance of idle actuator:
 term. 4 to term. 5: $17 \dots 19.5 \Omega$ (at $+20^\circ\text{C}$)
 term. 4 to term. 3: $19 \dots 21.5 \Omega$ (at $+20^\circ\text{C}$)
 If replacing the idle actuator, pay attention to its direction of flow (arrow on housing).
- Replace control unit.

Note:

To prevent confusion between the control units of the different systems, a mechanical encoding system has been introduced. The "lug" (pivot point when opening and connecting the control unit) and the corresponding mount on the control unit have mating recesses and pins.

Continued on G17/G18

G 15

Test with universal test adapter
Porsche 944 (USA)



G 16

Test with universal test adapter
Porsche 944 (USA)



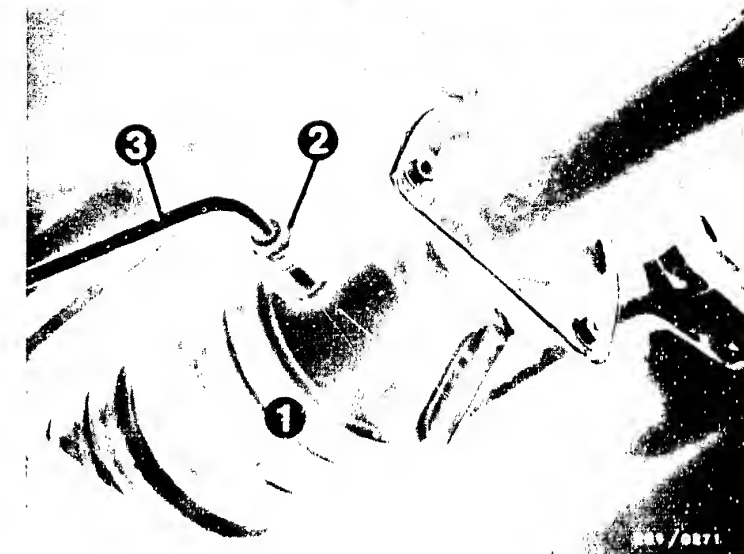
TEST STEP 42		Connect CO analyzer to test fitting	
Operation		Reading	Testing
Program switch position "V"	20	CO rises up to approx. 4 ... 5 vol. %	<u>Component:</u> Control unit
Program switch position "Ω"	22	After approx. 10 s CO drops again.	
Measuring equipment: CO analyzer		<div> <div>yes</div> <div>↓</div> <div>Continue testing with next test step</div> </div> <div>no</div> <div>↓</div>	<u>Operation:</u> Lambda closed-loop control, upper limit of closed-loop control, term. 24 to ground
Measuring range: 10 vol. %			<u>Malfunction:</u> CO unchanged
Connection: at test fitting			
Operation in vehicle: Let engine run at op. temp.			

Trouble-shooting:

- Replace control unit.

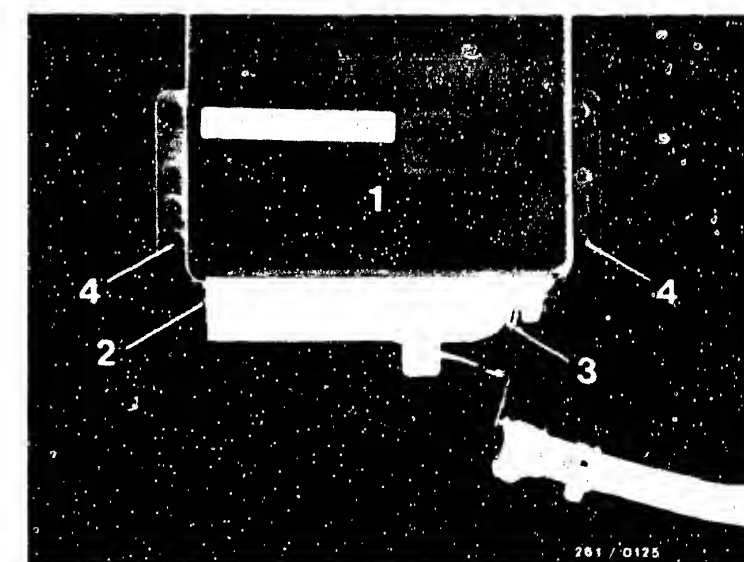
Note

To prevent confusion between the control units of the different systems, a mechanical encoding system has been introduced. The "lug" (pivot point when opening and connecting the control unit) and the corresponding mount on the control unit have mating recesses and pins.



1=Catalytic converter
2=Test connection
3=Exhaust test pipe

1=Control unit (as of 1.85)
2=Lug
3=Detent
4=Mounting holes



G17

Test with universal test adapter
Porsche 944 (USA)



G18

Test with universal test adapter
Porsche 944 (USA)



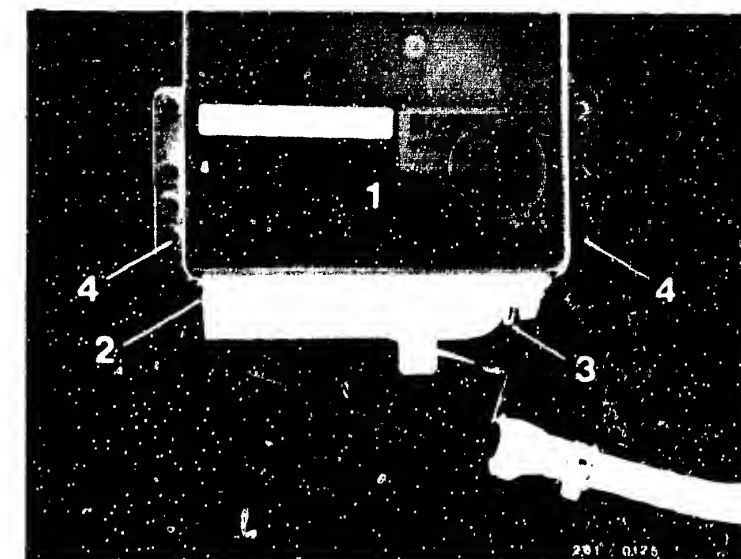
TEST STEP 43			
Operation		Reading	Testing
Program switch position "V"	20	CO drops below 0.2 vol. %	Component: Control unit
Program switch position "Ω"	23	Engine runs rough	
Measuring equipment: CO analyzer	<div> <div>yes</div> <div>no</div> </div>		Operation:
Measuring range: 2.5 vol. %			Lambda closed-loop control, lower limit of closed-loop control, term. 24 to +2 V
Connection: at test fitting			Malfunction:
Operation in vehicle: Let engine run			CO concentration unchanged

Trouble-shooting:

- Replace control unit.

Note

To prevent confusion between the control units of the different systems, a mechanical encoding system has been introduced. The "lug" (pivot point when opening and connecting the control unit) and the corresponding mount on the control unit have mating recesses and pins.



- 1=Control unit (as of 1.85)
- 2=Lug
- 3=Detent
- 4=Mounting holes

G 19

Test with universal test adapter
Porsche 944 (USA)



G 20

Test with universal test adapter
Porsche 944 (USA)



TEST STEP 44			
Operation		Reading	Testing
Program switch position "V"	20	0.2 to 0.6 vol. %	Component: Lambda sensor
Program switch position "Ω"	24		
Measuring equipment: CO analyzer	<div> <div>yes</div> <div>↓</div> <div>Testing with universal test adapter completed</div> </div> <div>no</div> <div>↓</div>		Operation: Lambda closed-loop control, term. 24 connected to lambda sensor
Measuring range: 2.5 vol. %			Malfunction: CO concentration not within tolerance
Connection: at test fitting			
Operation in vehicle: Let engine run			

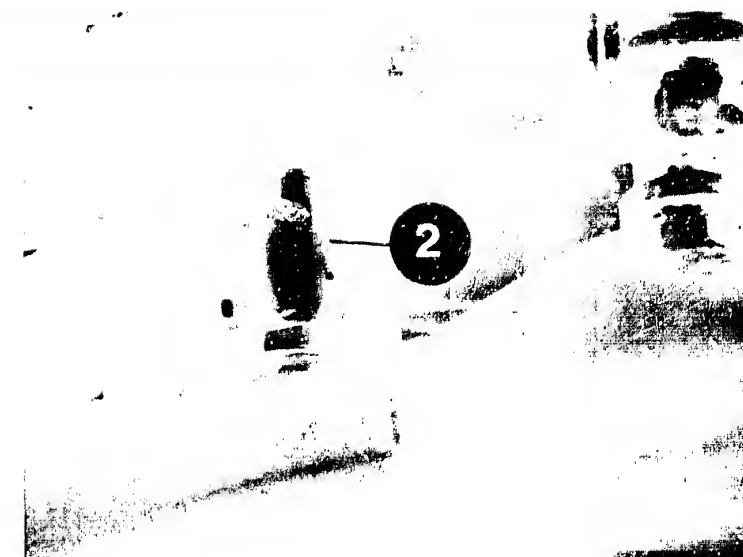
Trouble-shooting:

1. Replace lambda sensor

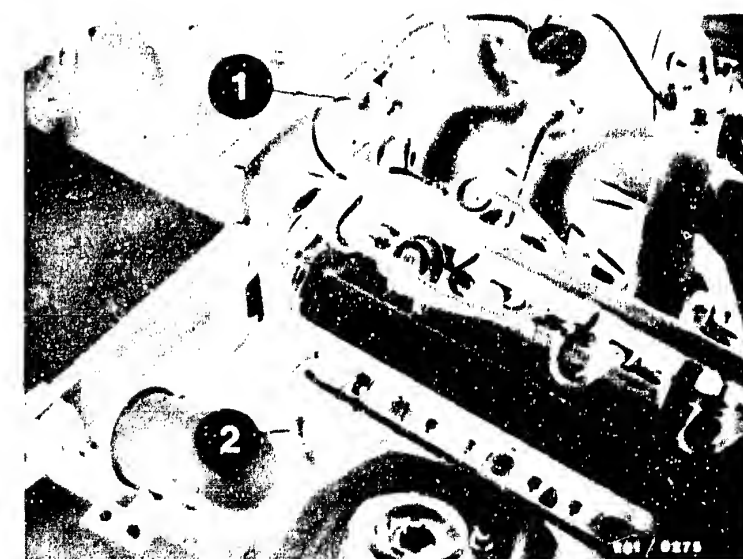
When replacing the sensor, coat its thread with special mounting paste VS 14016 Ft (5 964 080 105). Make sure that only threads are filled and that no paste gets into the slots.

If necessary, before taking apart, clean the plug connector in the sensor lead. When connecting, do not allow any dirt to get into the plug and make sure that the plug latches properly.

2. If 1. without success, replace the control unit.



1=Plug connector for lambda sensor
2=Lambda sensor



G21

Test with universal test adapter
Porsche 944 (USA)



G22

Test with universal test adapter
Porsche 944 (USA)



Testing with the universal test adapter is now completed. If the fault has not been found or if further instructions and information are required on how to remedy the fault, proceed according to the trouble-shooting program of your choice.

- Detailed trouble-shooting - see C3 - C4
- Direct trouble-shooting - see C5 - C10



STARTING MOTOR OPERATES, ENGINE FAILS TO START OR STARTS ONLY WITH GREAT DIFFICULTY

11. Trouble-shooting program according to customer complaint

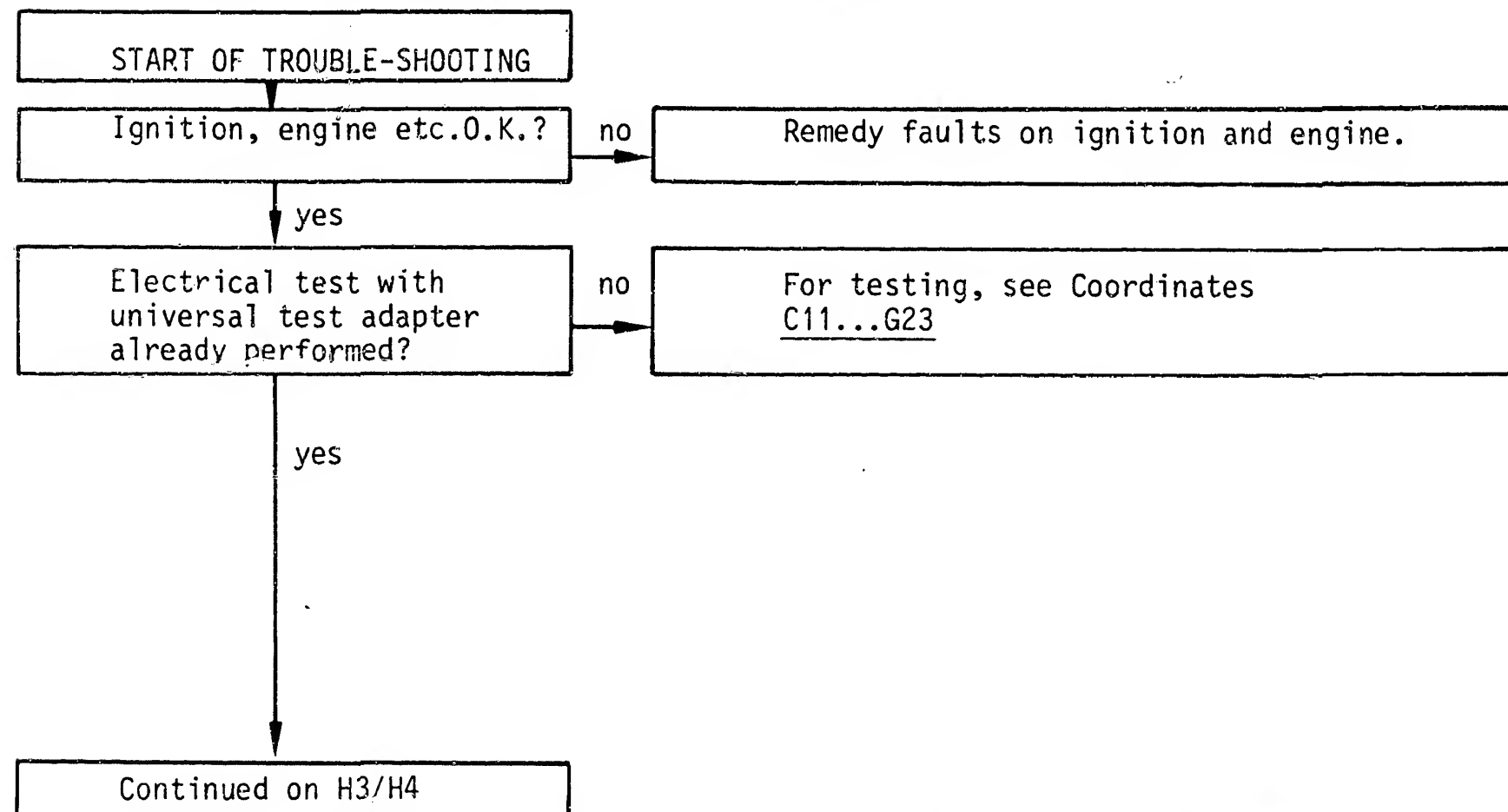
Procedure

The test is divided into 3 rows of boxes:

- The left-hand row contains the questions on the tests.
- The center row describes the testing and adjusting operations on the components.
- The right-hand row shows the illustrations belonging to the text and explains the illustrations.

If the questions can be answered conclusively with "yes" without testing, proceed to the next question down.

If, on the other hand, the answer to the question is "no" and you suspect a fault, branch to the center row of boxes and carry out the tests given there. After testing, continue trouble-shooting at the point at which you branched off.



H1

Engine fails to start
Porsche 944 (USA)



H2

Engine fails to start
Porsche 944 (USA)



Starting motor operates, engine fails to start or starts only with great difficulty
(continued)

yes

Check secondary pattern of all cylinders at cranking speed. Secondary pattern O.K.?

no

Check ignition coil and high-tension part: Distributor cap oil-fouled outside and inside? (Unscrew distributor rotor and check camshaft seal).

Notes:

Distributor cap clamping hooks correctly mounted? For mounting, it is advisable to remove the ignition cable for cylinder 3 on the distributor cover in order to have better access to the lower clamping hook. Note the cylinder number when connecting the ignition cables. Do not forget cap and screening cover. Check ignition coil, primary, for continuity (approx. $0\ \Omega$). Secondary resistance: $5...7.2\ k\Omega$. Check interference-suppression resistors, ignition cables and spark plugs.

Value of interference-suppression resistor in

High-voltage distributor rotor:	$1\ k\Omega$
High-voltage distributor domes:	$1\ k\Omega$ each
Spark-plug connectors:	$3\ k\Omega$ each
Spark plug:	$4...6\ k\Omega$ each
Ignition coil:	$0\ k\Omega$

yes

While cranking, feel all injection valves by hand. Can needle movement be felt?

no

Check solenoid-operated injection valve with ohm-meter.

Test specification: $2...3\ \Omega$
If necessary, replace defective solenoid-operated injection valve.

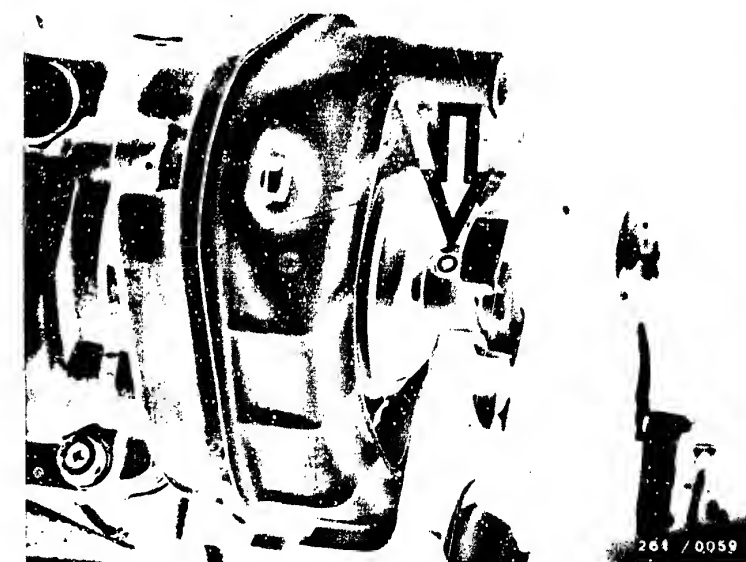
yes

Continued on H5/H6



High-voltage distributor
1 to 4=Cylinder numbers
ZS=High-tension cable to ignition coil
5=Clamping hook

Arrow=Distributor rotor (screwed)



H3

Engine fails to start
Porsche 944 (USA)



H4

Engine fails to start
Porsche 944 (USA)



Starting motor operates, engine fails to start or starts only with great difficulty
(continued)

yes

Solenoid-operated injection
valves O.K.?
(continued)

no

Removing the injection valves

Loosen fastening screws on fuel-distribution pipe. Pull fuel-distribution pipe upward until the injection valves are out of the holes in the intake manifold. Do not damage nozzle needle or rubber seals.

Check nozzle needle and surrounding area for leaks and deposits. Remove electrical connection. Carefully slide holding clamps out of the groove and pull injection valve out of the fuel-distribution pipe connection.

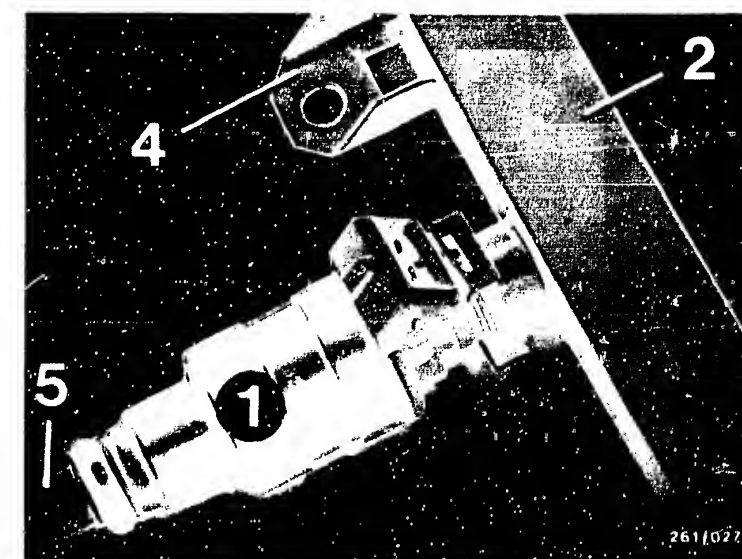
Installing the injection valves

Replace seals. Press on new protection sleeve (included in repair kit) so that the nozzle needle is not damaged.

Check both rubber seals for correct seating. Simultaneously press all 4 injection valves into their seats with the fuel-distribution pipe. Screw down the fuel-distribution pipe. Check all air and fuel hoses for correct seating. Establish electrical connections. Start engine and check whether any unmetered air is being drawn in.

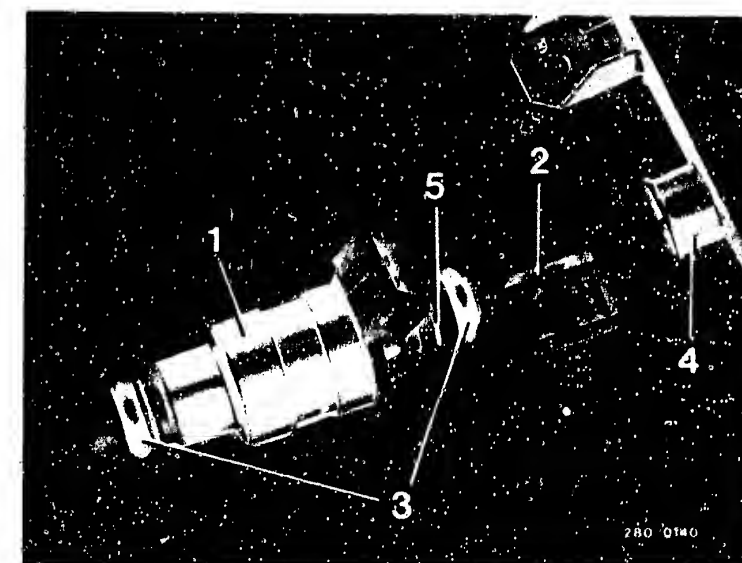
yes

Continued on H7/H8



1=Injection valve
2=Fuel-distribution pipe
4=Mounting bracket
5=Protection sleeve

1=Injection valve
2=Holding clamp
3=Rubber seal
4=Fuel-distribution pipe connection
5=Groove



H5

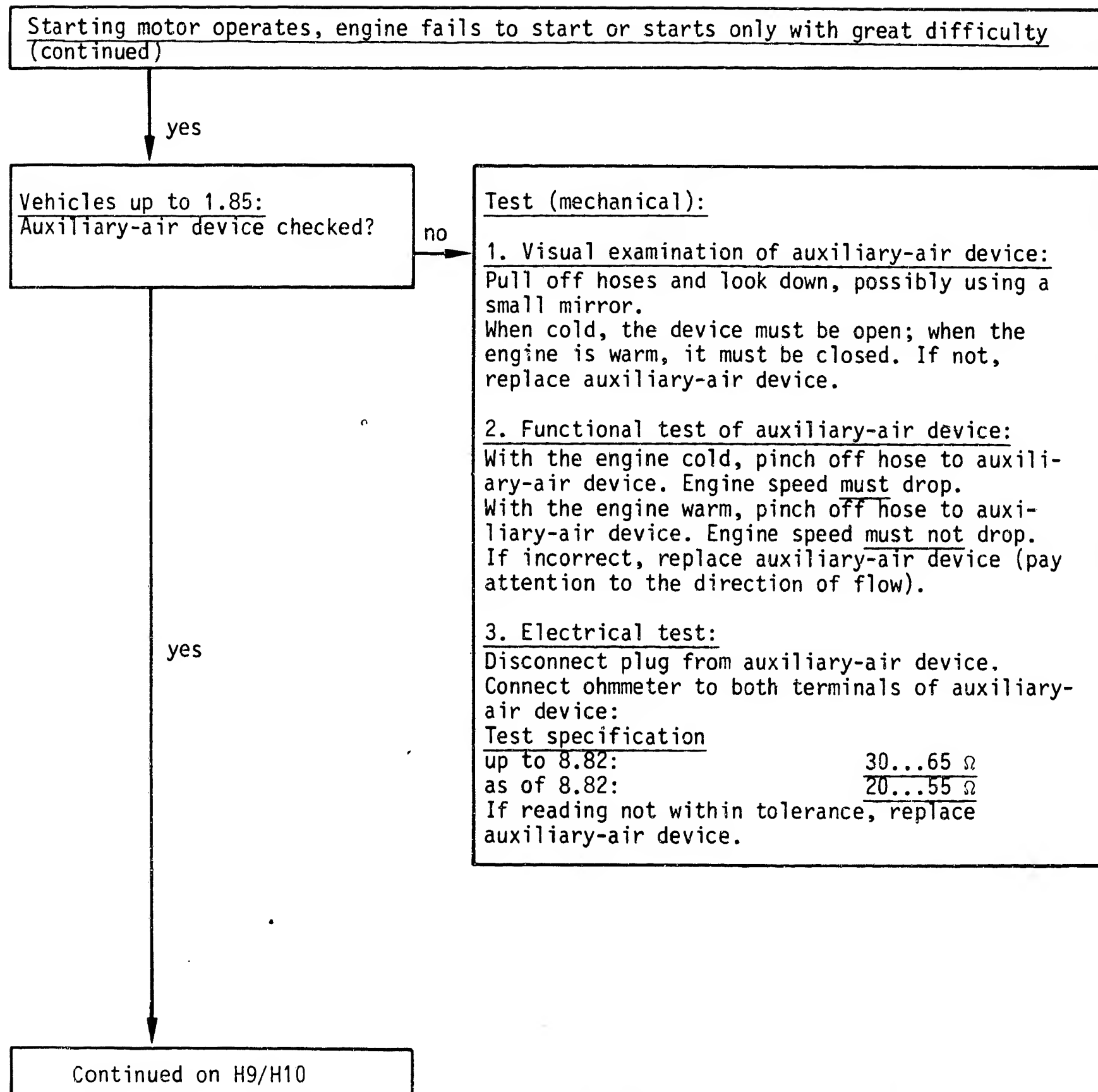
Engine fails to start
Porsche 944 (USA)



H6

Engine fails to start
Porsche 944 (USA)





Arrow=Auxiliary-air device

H7

Engine fails to start
Porsche 944 (USA)



H8

Engine fails to start
Porsche 944 (USA)



Starting motor operates, engine fails to start or starts only with great difficulty
(continued)

yes

Vehicles as of 1.85
Idle actuator mechanically
O.K.?

no

The idle actuator is tested electrically with the test adapter. For the mechanical test, the rotary slider in the idle actuator must be checked for freedom of movement as follows:

Remove idle actuator. Disconnect plug. Connect center terminal No. 4 to battery voltage. Connect outer terminal No. 3 to ground. By means of a visual examination, check whether the rotary slider turns to its end stop. Change over the outer terminal, i.e. connect No. 5 to ground. Rotary slider must now turn to the opposite end stop. If defective, replace idle actuator. When installing the idle actuator, pay attention to its direction of flow.

yes

Continued on H11/H12



Arrow=Idle actuator

H9

Engine fails to start
Porsche 944 (USA)



H10

Engine fails to start
Porsche 944 (USA)



Starting motor operates, engine fails to start or starts only with great difficulty
(continued)

yes

Air-flow sensor mechanically
O.K.?

no

Testing:

Open air-flow sensor flap by hand. It must be possible to open the sensor flap with uniform ease from its fully closed position to its fully open position. When released, the sensor flap must close again fully by itself. Sensor flap must not catch when opening. Watch for signs of abrasion and rubbing. Clean air-flow sensor if inside is very dirty and rub out with a lint-free cloth. If signs of abrasion or rubbing, replace air-flow sensor.

yes

Are all hose lines and electrical lead connections correctly connected? Visual examination. Air-intake system checked for leaks?

no

Check whether hoses of air-intake system and of fuel line system are correctly connected, not kinked or damaged. If necessary, replace hoses. Eliminate leaks by means of new seals or by re-tightening the connecting screws.

Leak test:

Seal off exhaust tail pipe. Take out air filter element and seal off opening to air-flow sensor. Unscrew hose after auxiliary-air device/idle actuator and seal opening to auxiliary-air device/idle actuator. Using compressed-air gun, blow air (0.3 bar gauge pressure) into the intake manifold. Open throttle valve fully while doing this. Using soapy water, brush or spray all joints. Bubbling or foaming indicates a leak. Check electrical plug-in contacts for loose contacts.

yes

Continued on H13/H14



- 1=Throttle-valve switch
- 2=Engine temperature sensor (NTC II)
- 3=Air-flow sensor with NTC I
- 4=Idle-mixture-adjusting screw

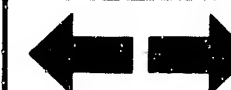
H11

Engine fails to start
Porsche 944 (USA)



H12

Engine fails to start
Porsche 944 (USA)



Starting motor operates, engine fails to start or starts only with great difficulty
(continued)

yes

Testing completed for customer complaint

"Starting motor operates, engine fails to start or starts only with great difficulty".

Customer complaint remedied?

no

Further possibilities:

- Customer complaint incorrectly diagnosed (see Coordinates C3...C10). If the fault has not been detected by "Direct trouble-shooting", see "Detailed trouble-shooting" (Coordinates C3/C4).
- Engine not mechanically O.K. (compression, valve setting, valve timing, worn camshaft).

H13

Engine fails to start
Porsche 944 (USA)



H14

Engine fails to start
Porsche 944 (USA)



ENGINE STARTS BUT THEN DIES

Trouble-shooting program according to customer complaint

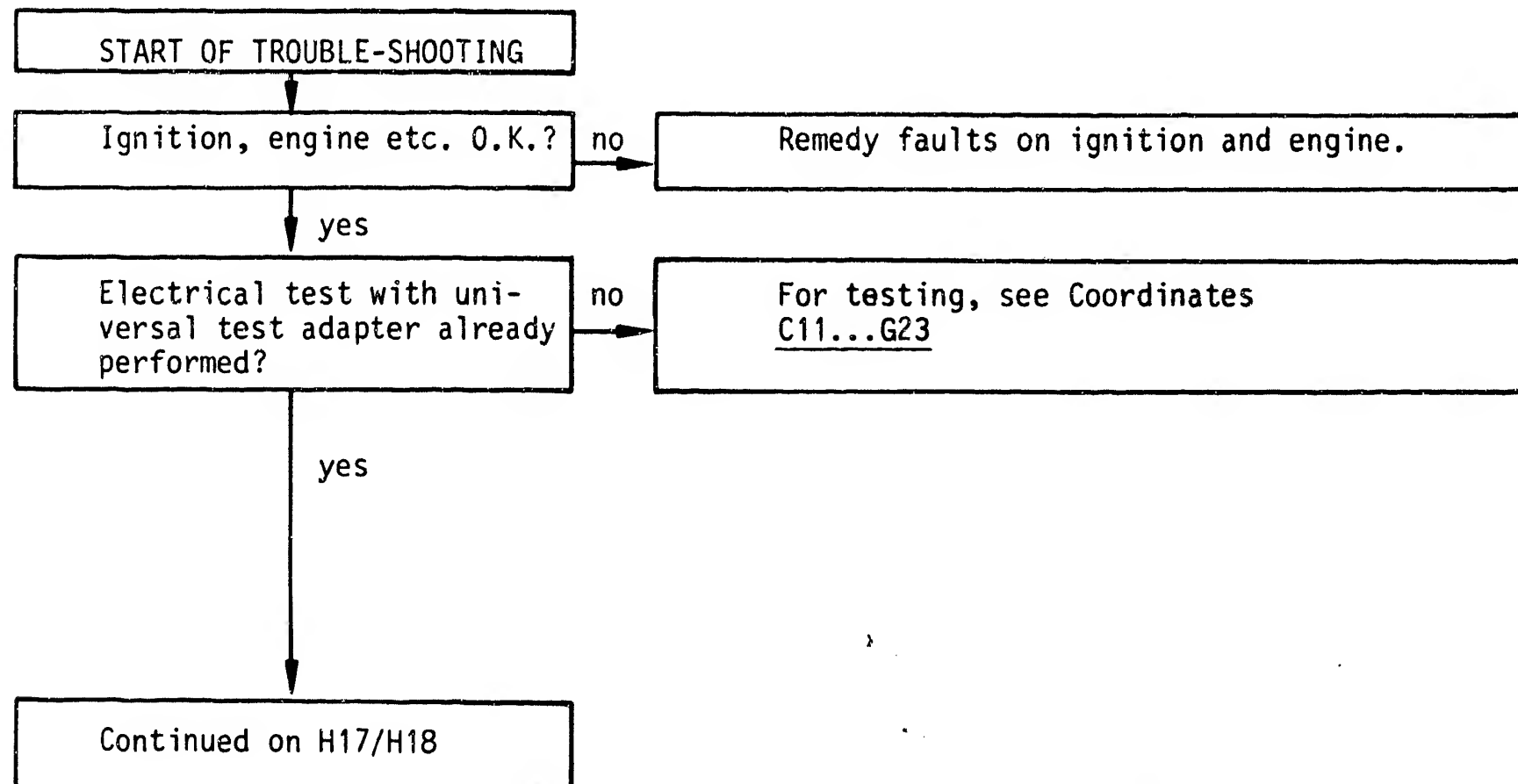
Procedure

The test is divided into 3 rows of boxes:

- The left-hand row contains the questions on the tests.
- The center row describes the testing and adjusting operations on the components.
- The right-hand row shows the illustrations belonging to the text and explains the illustrations.

If the questions can be answered conclusively with "yes" without testing, proceed to the next question down.

If, on the other hand, the answer to the question is "no" and you suspect a fault, branch to the center row of boxes and carry out the tests given there. After testing, continue trouble-shooting at the point at which you branched off.



H15

Engine starts but then dies
Porsche 944 (USA)



H16

Engine starts but then dies
Porsche 944 (USA)



Engine starts but then dies (continued)

yes

Are all hose lines and electrical lead connections correctly connected? Visual examination. Air-intake system checked for leaks?

no

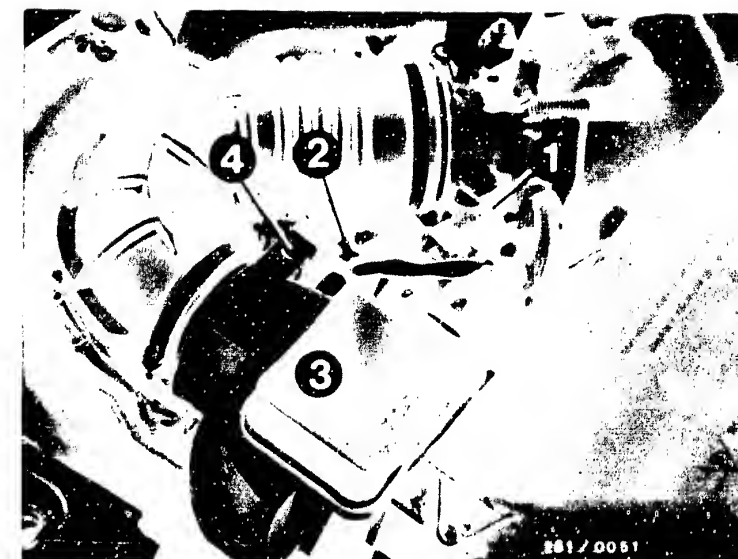
Check whether hoses of air-intake system and of fuel line system are correctly connected, not kinked or damaged. If necessary, replace hoses. Eliminate leaks by means of new seals or by retightening the connecting screws.

Leak test:

Seal off exhaust tail pipe. Take out air filter element and seal off opening to air-flow sensor. Unscrew hose after auxiliary-air device/idle actuator and seal opening to auxiliary-air device/idle actuator. Using compressed-air gun, blow air (0.3 bar gauge pressure) into the intake manifold. Open throttle valve fully while doing this. Using soapy water, brush or spray all joints. Bubbling or foaming indicates a leak. Check electrical plug-in contacts for loose contacts.

yes

Continued on H19/H20



- 1=Throttle-valve switch
- 2=Engine temperature sensor (NTC II)
- 3=Air-flow sensor with NTC I
- 4=Idle-mixture-adjusting screw

H17

Engine starts but then dies
Porsche 944 (USA)



H18

Engine starts but then dies
Porsche 944 (USA)



Engine starts but then dies (continued)

yes

Vehicles up to 1.85:
Auxiliary-air device checked?

no

Test (mechanical):

1. Visual examination of auxiliary-air device:
Pull off hoses and look down, possibly using a small mirror.
When cold, the device must be open; when the engine is warm, it must be closed. If not, replace auxiliary-air device.

2. Functional test of auxiliary-air device:
With the engine cold, pinch off hose to auxiliary-air device. Engine speed must drop.
With the engine warm, pinch off hose to auxiliary-air device. Engine speed must not drop.
If incorrect, replace auxiliary-air device (pay attention to the direction of flow).

3. Electrical test:
Disconnect plug from auxiliary-air device.
Connect ohmmeter to both terminals of auxiliary-air device:
Test specification
up to 8.82: $30...65\ \Omega$
as of 8.82: $20...55\ \Omega$
If reading not within tolerance, replace auxiliary-air device.

yes

Continued on H21/H22



Arrow=Auxiliary-air device

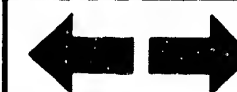
H19

Engine starts but then dies
Porsche 944 (USA)



H20

Engine starts but then dies
Porsche 944 (USA)



Engine starts but then dies (continued)

yes

Vehicles as of 1.85
Idle actuator mechanically
O.K.?

no

The idle actuator is tested electrically with the test adapter. For the mechanical test, the rotary slider in the idle actuator must be checked for freedom of movement as follows:

Remove idle actuator. Disconnect plug. Connect center terminal No. 4 to battery voltage. Connect outer terminal No. 3 to ground. By means of a visual examination, check whether the rotary slider turns to its end stop. Change over the outer terminal, i.e. connect No. 5 to ground. Rotary slider must now turn to the opposite end stop. If defective, replace idle actuator. When installing the idle actuator, pay attention to its direction of flow.

yes

Continued on H23/H24



Arrow=Idle actuator

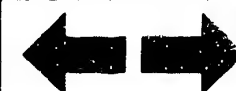
H21

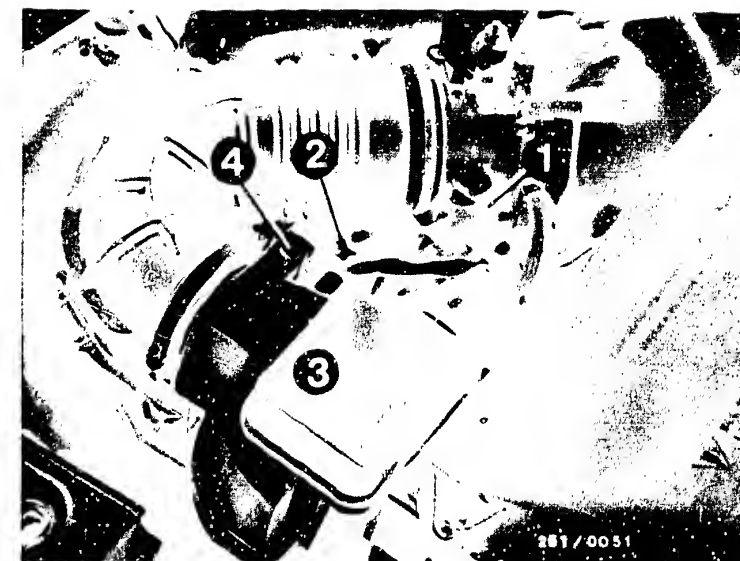
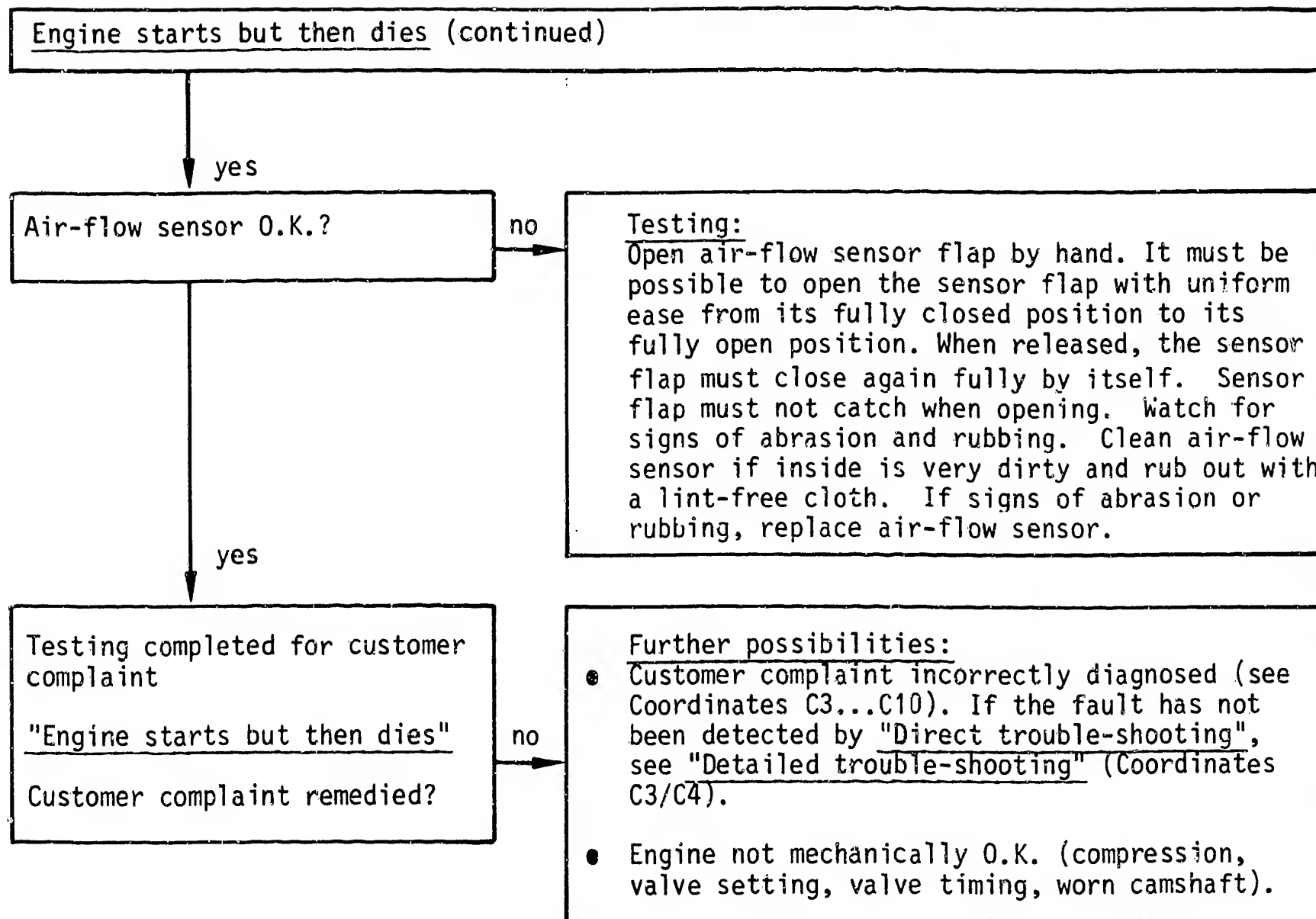
Engine starts but then dies
Porsche 944 (USA)



H22

Engine starts but then dies
Porsche 944 (USA)





1=Throttle-valve switch
2=Engine temperature sensor (NTC II)
3=Air-flow sensor with NTC I
4=Idle-mixture-adjusting screw



ROUGH IDLE/INCORRECT IDLE SPEED

Trouble-shooting program according to customer complaint

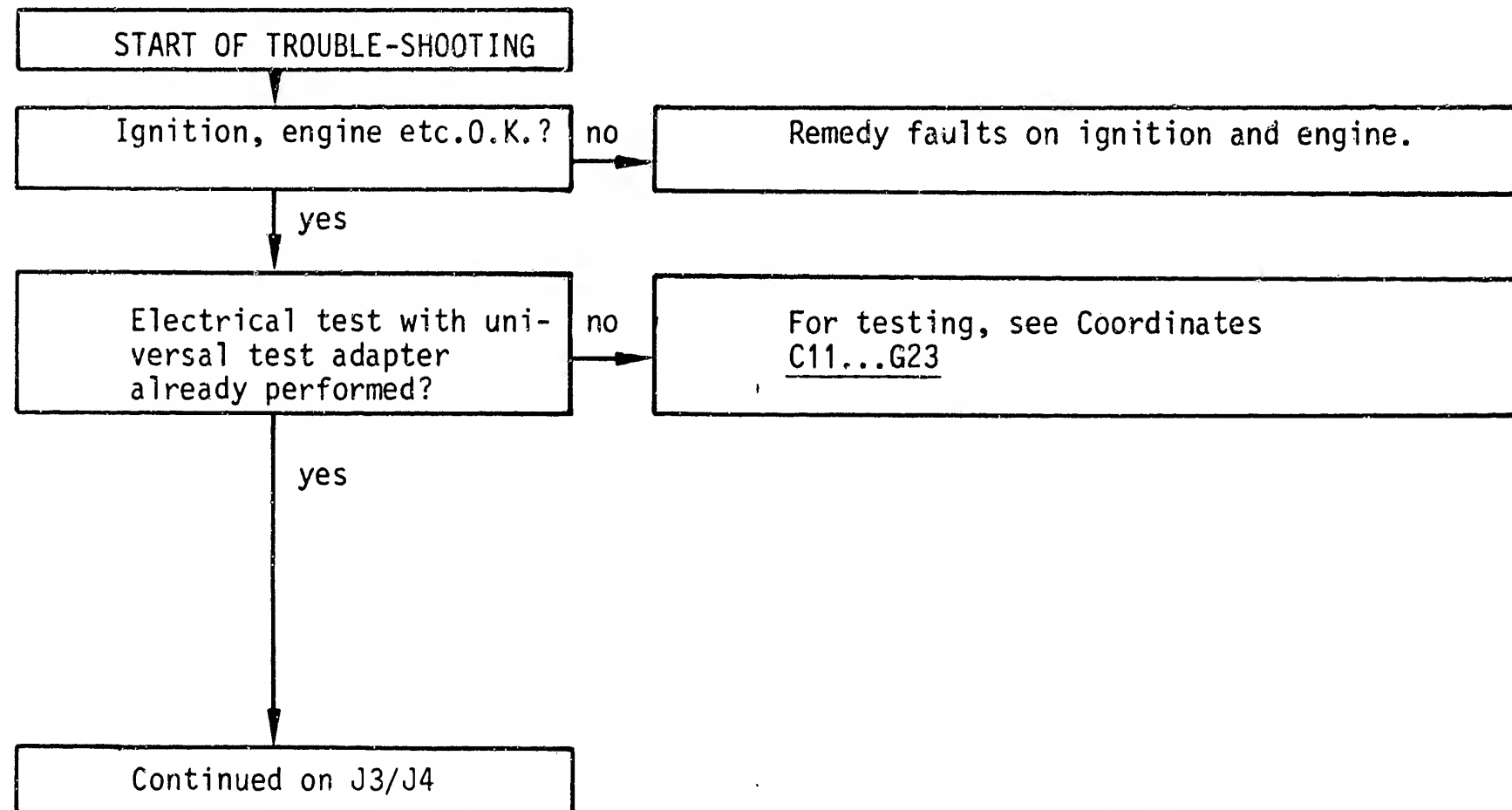
Procedure

The test is divided into 3 rows of boxes:

- The left-hand row contains the questions on the tests.
- The center row describes the testing and adjusting operations on the components
- The right-hand row shows the illustrations belonging to the text and explains the illustrations.

If the questions can be answered conclusively with "yes" without testing, proceed to the next question down.

If, on the other hand, the answer to the question is "no" and you suspect a fault, branch to the center row of boxes and carry out the tests given there. After testing, continue trouble-shooting at the point at which you branched off.



J1

Rough idle
Porsche 944 (USA)



J2

Rough idle
Porsche 944 (USA)



Rough idle/incorrect idle speed (continued)

yes

Check secondary pattern of all cylinders at cranking speed. Secondary pattern O.K.?

no

Check ignition coil and high-tension part: Distributor cap oil-fouled outside and inside? (Unscrew distributor rotor and check camshaft seal).

Notes:

Distributor cap clamping hooks correctly mounted? For mounting, it is advisable to remove the ignition cable for cylinder 3 on the distributor cover in order to have better access to the lower clamping hook. Note the cylinder number when connecting the ignition cables. Do not forget cap and screening cover. Check ignition coil, primary, for continuity (approx. $0\ \Omega$). Secondary resistance: $5...7.2\ k\Omega$. Check interference-suppression resistors, ignition cables and spark plugs.

Value of interference-suppression resistor in

High-voltage distributor rotor:	$1\ k\Omega$
High-voltage distributor domes:	$1\ k\Omega$ each
Spark-plug connectors:	$3\ k\Omega$ each
Spark plug:	$4...6\ k\Omega$ each
Ignition coil:	$0\ k\Omega$

yes

Air-flow sensor O.K.?

no

Testing:

Open air-flow sensor flap by hand. It must be possible to open the sensor flap with uniform ease from its fully closed position to its fully open position. When released, the sensor flap must close again fully by itself. Sensor flap must not catch when opening. Watch for signs of abrasion and rubbing. Clean air-flow sensor if inside is very dirty and rub out with a lint-free cloth. If signs of abrasion or rubbing, replace air-flow sensor.

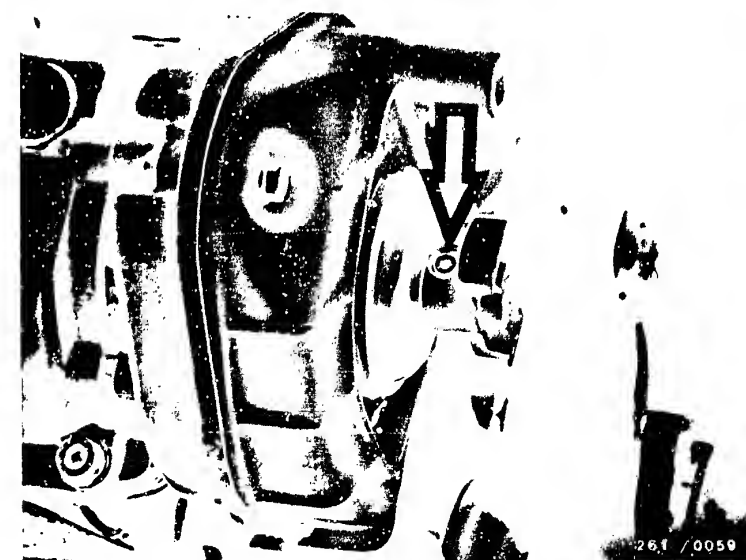
yes

Continued on J5/J6



1 to 4=Cylinder numbers
5=Clamping hook
ZS=High-tension cable to ignition coil

Arrow=Distributor rotor (screwed)



J3

Rough idle
Porsche 944 (USA)



J4

Rough idle
Porsche 944 (USA)



Engine starts but then dies (continued)

yes

Are all hose lines and electrical lead connections correctly connected? Visual examination. Air-intake system checked for leaks?

no

Check whether hoses of air-intake system and of fuel line system are correctly connected, not kinked or damaged. If necessary, replace hoses. Eliminate leaks by means of new seals or by retightening the connecting screws.

Leak test:

Seal off exhaust tail pipe. Take out air filter element and seal off opening to air-flow sensor. Unscrew hose after auxiliary-air device/idle actuator and seal opening to auxiliary-air device/idle actuator. Using compressed-air gun, blow air (0.3 bar gauge pressure) into the intake manifold. Open throttle valve fully while doing this. Using soapy water, brush or spray all joints. Bubbling or foaming indicates a leak. Check electrical plug-in contacts for loose contacts.

yes

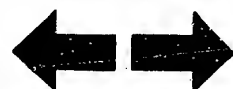
Continued on J7/J8



- 1=Throttle-valve switch
- 2=Engine temperature sensor (NTC II)
- 3=Air-flow sensor with NTC I
- 4=Idle-mixture-adjusting screw

J5

Rough idle
Porsche 944 (USA)



J6

Rough idle
Porsche 944 (USA)



Rough idle/incorrect idle speed (continued)

yes

Vehicles up to 1.85:
Auxiliary-air device checked?

no

Test (mechanical):

1. Visual examination of auxiliary-air device:
Pull off hoses and look down, possibly using a small mirror.
When cold, the device must be open; when the engine is warm, it must be closed. If not, replace the auxiliary-air device.

2. Functional test of auxiliary-air device:
With the engine cold, pinch off hose to auxiliary-air device. Engine speed must drop.
With the engine warm, pinch off hose to auxiliary-air device. Engine speed must not drop.
If incorrect, replace auxiliary-air device (pay attention to the direction of flow).

3. Electrical test:
Disconnect plug from auxiliary-air device.
Connect ohmmeter to both terminals of auxiliary-air device:
Test specification
up to 8.82: 30...65 Ω
as of 8.82: 20...55 Ω
If reading not within tolerance, replace auxiliary-air device.

yes

Continued on J9/J10



Arrow=Auxiliary-air device

J7

Rough idle/incorrect idle speed
Porsche 944 (USA)



J8

Rough idle/incorrect idle speed
Porsche 944 (USA)



Rough idle/incorrect idle speed (continued)

yes

Vehicles as of 1.85:
Idle actuator mechanically
O.K.?

no

The idle actuator is tested electrically with the test adapter. For the mechanical test, the rotary slider in the idle actuator must be checked for freedom of movement as follows:

Remove idle actuator. Disconnect plug. Connect center terminal No. 4 to battery voltage. Connect outer terminal No. 3 to ground. By means of a visual examination, check whether the rotary slider turns to its end stop. Change over the outer terminal, i.e. connect No. 5 to ground. Rotary slider must now turn to the opposite end stop. If defective, replace idle actuator. When installing the idle actuator, pay attention to its direction of flow.

yes

Continued on J11/J12



Arrow=Idle actuator

J9

Rough idle
Porsche 944 (USA)



J10

Rough idle
Porsche 944 (USA)



Rough idle/incorrect idle speed (continued)

yes

Solenoid-operated injection valve mechanically O.K.?

no

With the engine running, disconnect injection-valve connectors individually, one after the other, from the injection valves and plug on again. Engine speed must drop if injection valve O.K.. If not, replace injection valve.

Removing the injection valves

Loosen fastening screws on fuel-distribution pipe. Pull fuel-distribution pipe upward until the injection valves are out of the holes in the intake manifold. Do not damage nozzle needle or rubber seals.

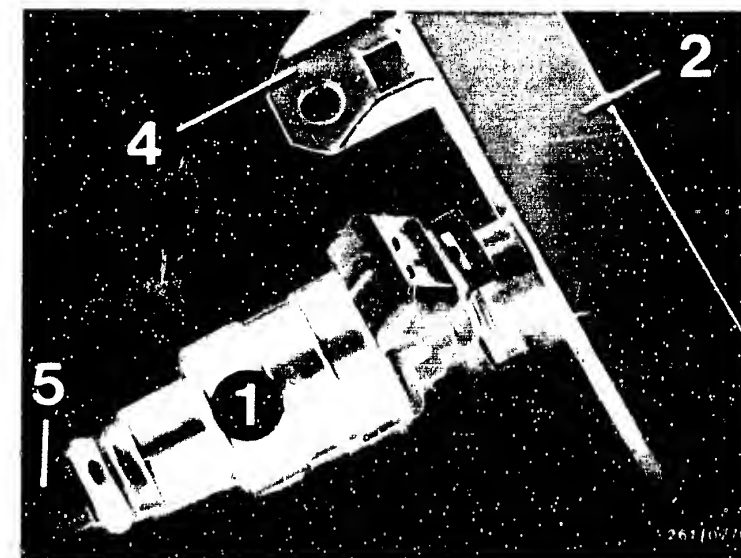
Check nozzle needle and surrounding area for leaks and deposits. Remove electrical connection. Carefully slide holding clamps out of the groove and pull injection valve out of the fuel-distribution pipe connection.

Installing the injection valves

Replace seals. Press on new protection sleeve (included in repair kit) so that the nozzle needle is not damaged. Check both rubber seals for correct seating. Simultaneously press all 4 injection valves into their seats with the fuel-distribution pipe. Screw down the fuel-distribution pipe. Check all air and fuel hoses for correct seating. Establish electrical connections. Start engine and check whether any unmetered air is being drawn in.

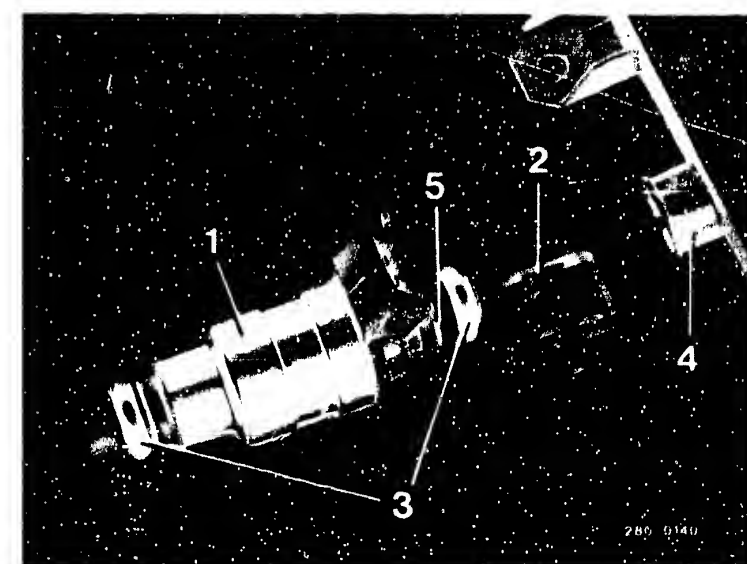
yes

Continued on J13/J14



- 1=Injection valve
- 2=Fuel-distribution pipe
- 4=Mounting bracket
- 5=Protection sleeve

- 1=Injection valve
- 2=Holding clamp
- 3=Rubber seal
- 4=Fuel-distribution pipe connection
- 5=Groove



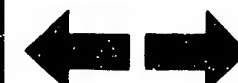
J11

Rough idle
Porsche 944 (USA)



J12

Rough idle
Porsche 944 (USA)



Rough idle/incorrect idle speed (continued)

CO concentration O.K.?

Test specification:

0.4 ... 0.8 vol.%CO

Measure at test connection
before catalytic converter

no

- Keep to sequence.
First measure CO.
Conditions: Engine at normal operating temperature, electrical loads off, ambient temperature +15°C...+35°C.
Take apart lambda sensor plug connector. Perform adjusting operations as quickly as possible so that the intake passages do not heat up too much, thus making the CO reading incorrect.

- Adjust exhaust gas with idle-mixture-adjusting screw in air-flow sensor. To do this, remove plug with special tool.

- Turning idle-mixture-adjusting screw to the right: CO concentration increases.

Turning idle-mixture-adjusting screw to the left: CO concentration decreases.

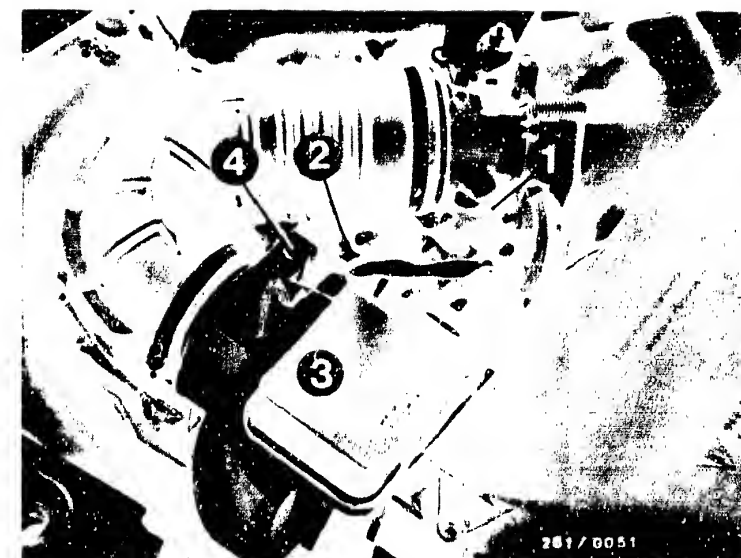
If CO not adjustable:

- CO concentration too low: Repeat leak test on air-intake system.
- CO concentration too high: Replace air-flow sensor.

Note: After CO adjustments, use new plug in air-flow sensor and screw on cap nut, greased, at test connection.

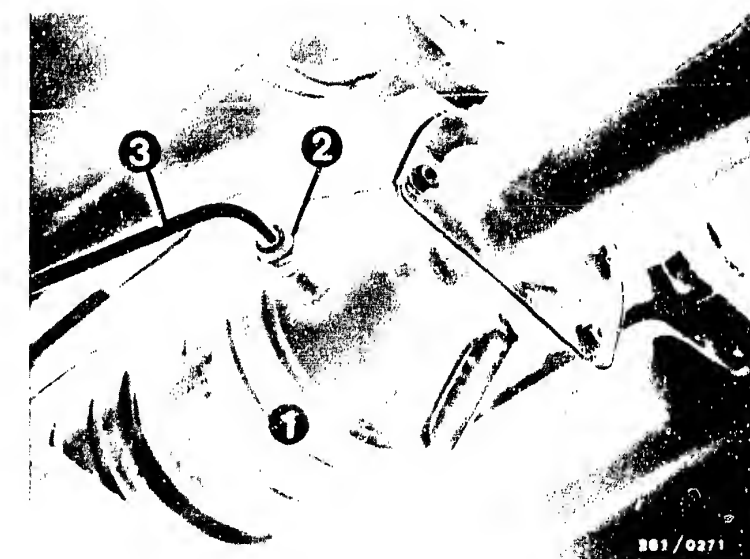
yes

Continued on J15/J16



1=Throttle-valve switch
2=Engine temperature sensor (NTC II)
3=Air-flow sensor with NTC I
4=Idle-mixture-adjusting screw

1=Catalytic converter
2=Test connection
3=Exhaust test pipe



J13

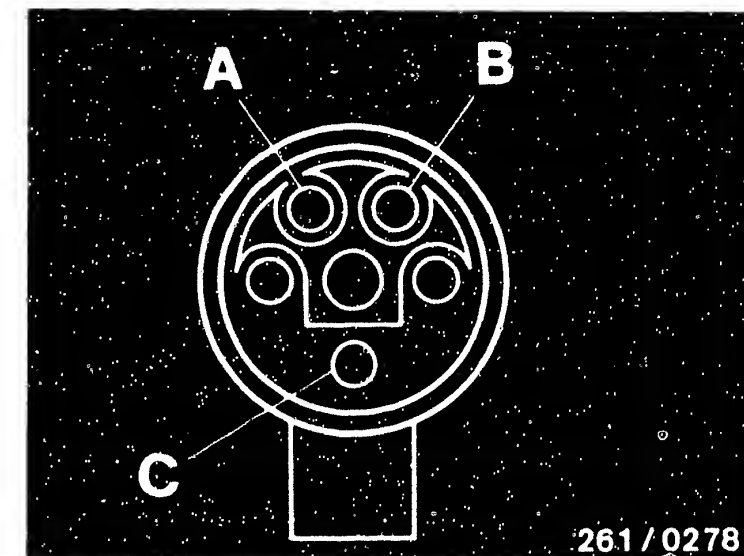
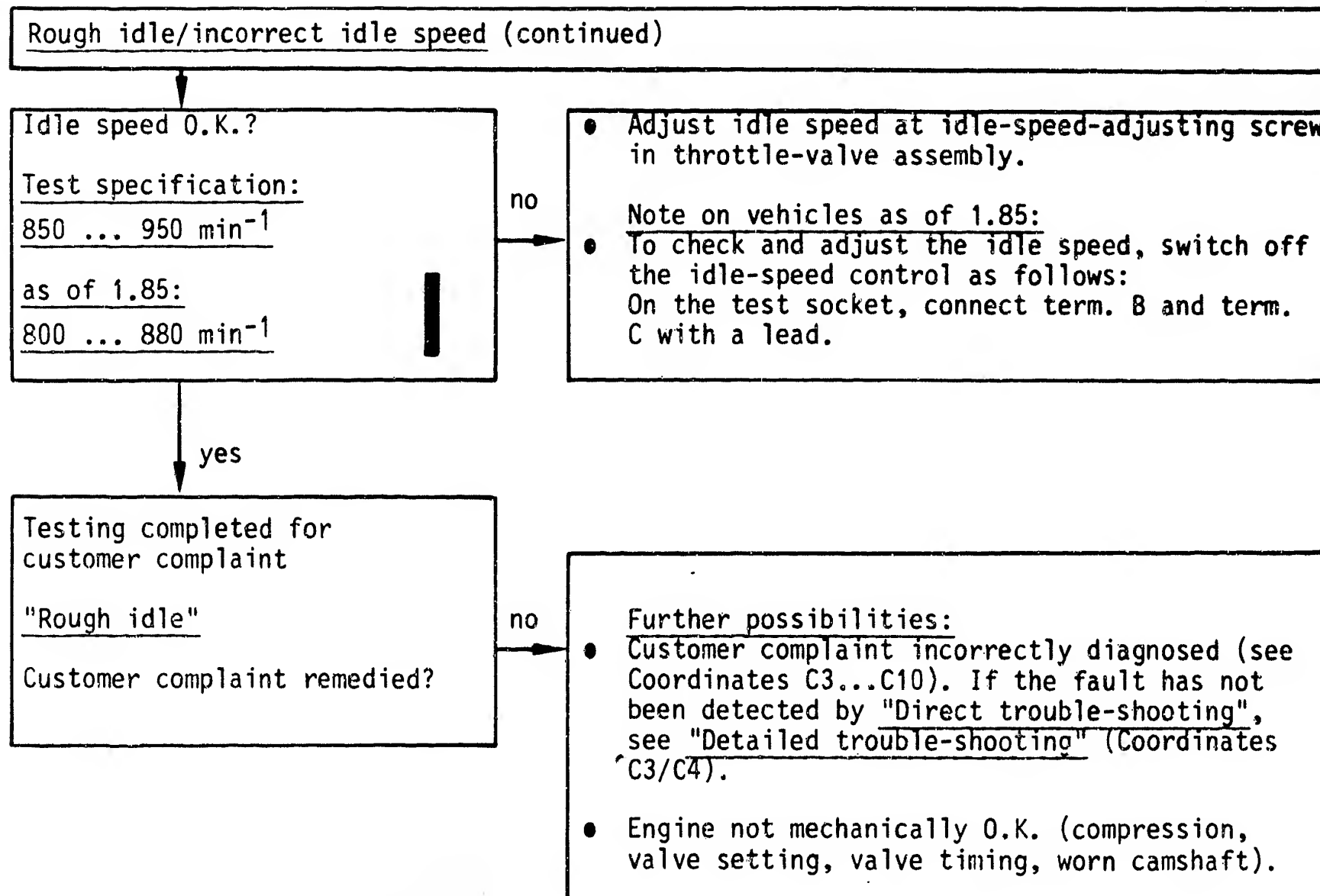
Rough idle
Porsche 944 (USA)



J14

Rough idle
Porsche 944 (USA)





261 / 0278

As of 1.85
Test socket on left in engine
compartment, near spring strut

Arrow=Idle-speed-adjusting screw



J15

Rough idle
Porsche 944 (USA)



J16

Rough idle
Porsche 944 (USA)



POOR THROTTLE TAKE-UP

Trouble-shooting program according to customer complaint

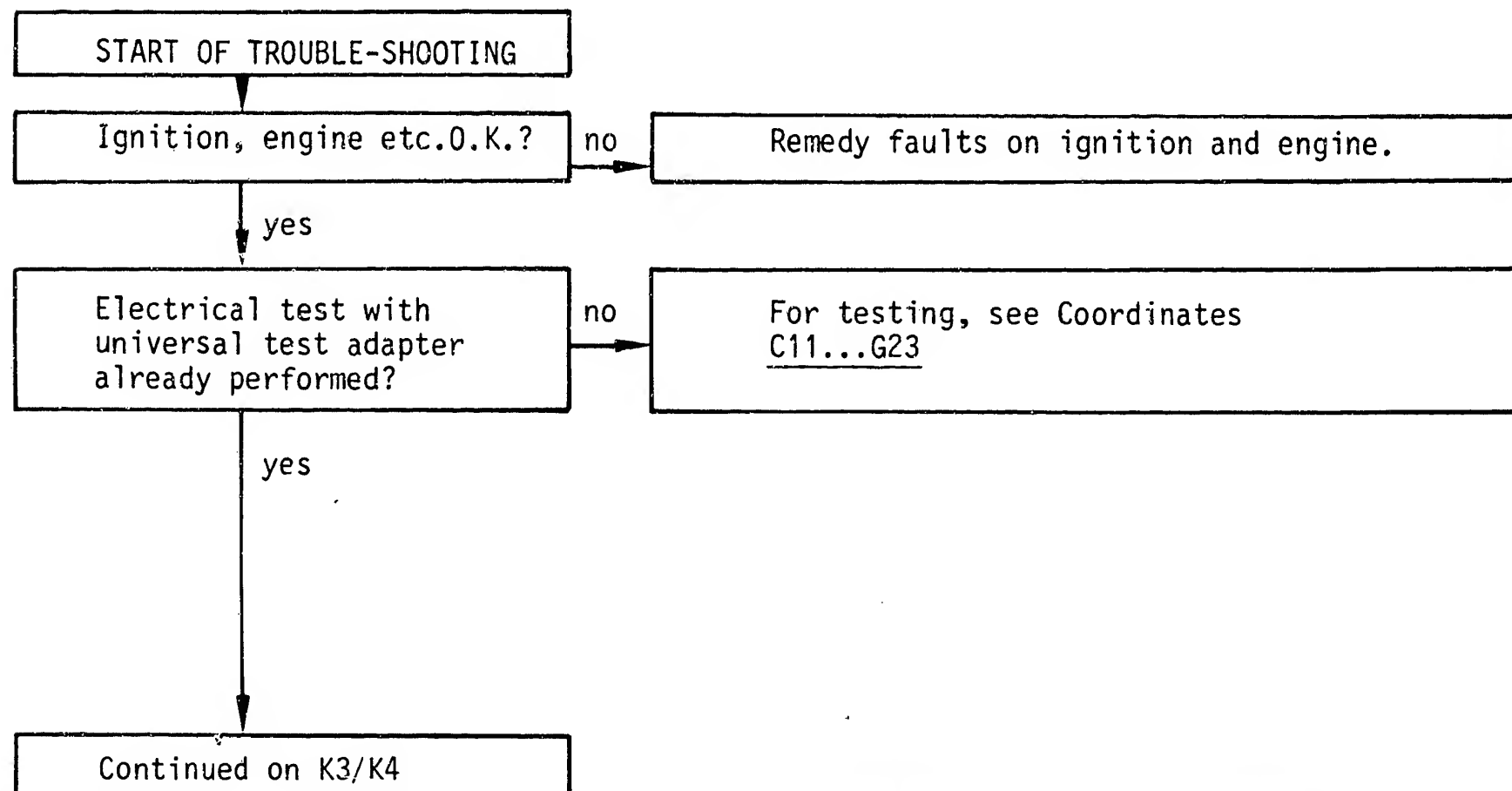
Procedure

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If the questions can be answered conclusively with "yes" without testing, proceed to the next question down.

If, on the other hand, the answer to the question is "no" and you suspect a fault, branch to the center row of boxes and carry out the tests given there. After testing, continue trouble-shooting at the point at which you branched off.



K1

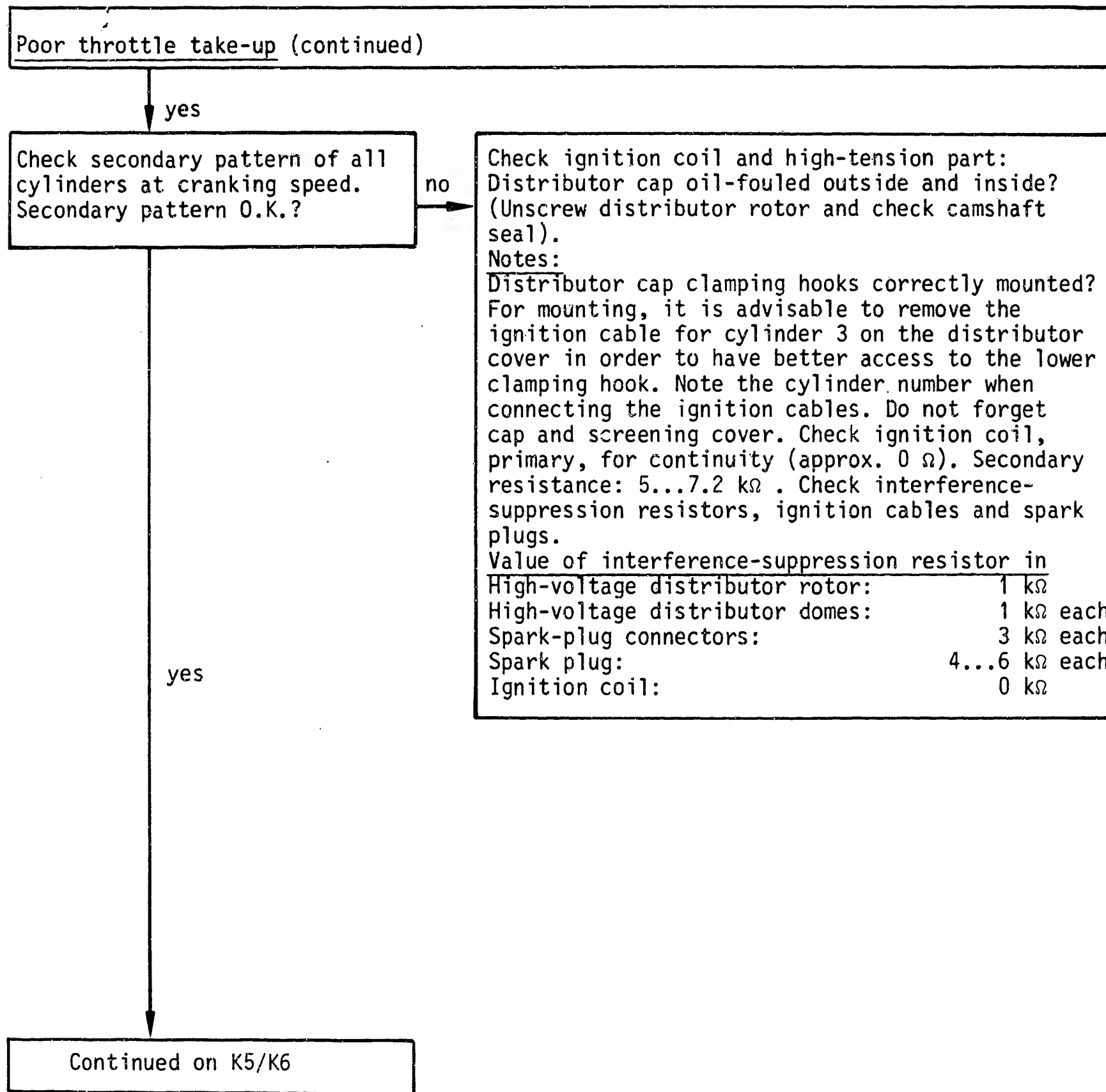
Poor throttle take-up
Porsche 944 (USA)



K2

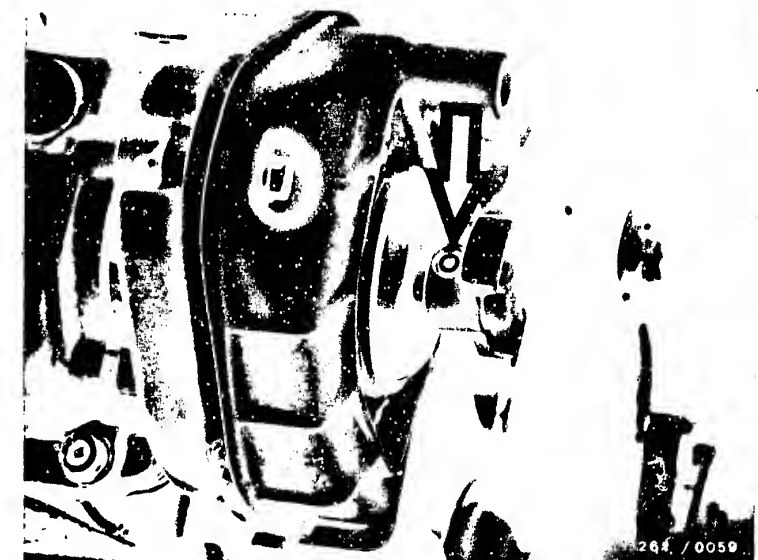
Poor throttle take-up
Porsche 944 (USA)





High-voltage distributor
1 to 4 =Cylinder numbers
ZS=High-tension cable to ignition coil
5=Clamping hook

Arrow=Distributor rotor (screwed)



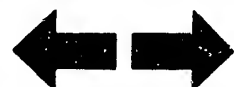
K3

Poor throttle take-up
Porsche 944 (USA)



K4

Poor throttle take-up
Porsche 944 (USA)



Poor throttle take-up (continued)

yes

Air-flow sensor mechanically O.K.?

no

Testing:
Open air-flow sensor flap by hand. It must be possible to open the sensor flap with uniform ease from its fully closed position to its fully open position. When released, the sensor flap must close again fully by itself. Sensor flap must not catch when opening. Watch for signs of abrasion and rubbing. Clean air-flow sensor if inside is very dirty and rub out with a lint-free cloth. If signs of abrasion or rubbing, replace air-flow sensor.

yes

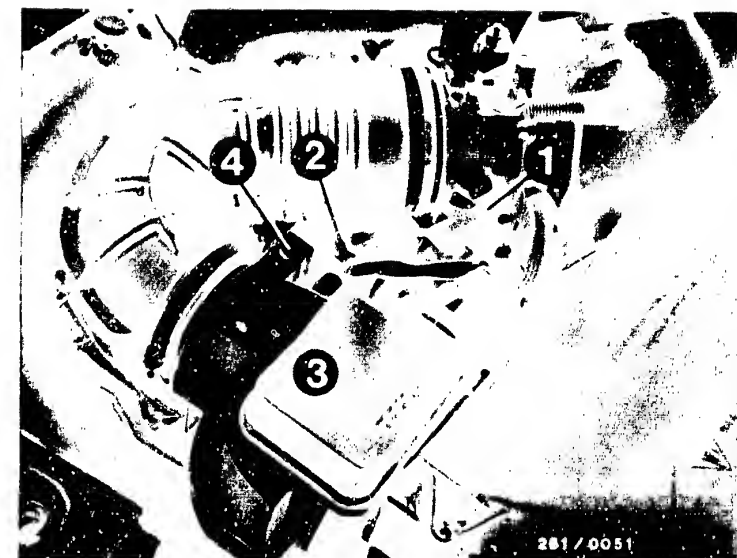
Are all hose lines and electrical lead connections correctly connected? Visual examination. Air-intake system checked for leaks?

no

Check whether hoses of air-intake system and of fuel line system are correctly connected, not kinked or damaged. If necessary, replace hoses. Eliminate leaks by means of new seals or by re-tightening the connecting screws.
Leak test:
Seal off exhaust tail pipe. Take out air filter element and seal off opening to air-flow sensor. Unscrew hose after auxiliary-air device/idle actuator and seal opening to auxiliary-air device/idle actuator. Using compressed-air gun, blow air (0.3 bar gauge pressure) into the intake manifold. Open throttle valve fully while doing this. Using soapy water, brush or spray all joints. Bubbling or foaming indicates a leak. Check electrical plug-in contacts for loose contacts.

yes

Continued on K7/K8



1=Throttle-valve switch
2=Engine temperature sensor (NTC II)
3=Air-flow sensor with NTC I
4=Idle-mixture-adjusting screw

K5

Poor throttle take-up
Porsche 944 (USA)



K6

Poor throttle take-up
Porsche 944 (USA)



Poor throttle take-up (continued)

yes

Vehicles up to 1.85:
Auxiliary-air device checked?

no

Test (mechanical):

1. Visual examination of auxiliary-air device:
Pull off hoses and look down, possibly using a small mirror.
When cold, the device must be open; when the engine is warm, it must be closed. If not, replace auxiliary-air device.

2. Functional test of auxiliary-air device:
With the engine cold, pinch off hose to auxiliary-air device. Engine speed must drop.
With the engine warm, pinch off hose to auxiliary-air device. Engine speed must not drop.
If incorrect, replace auxiliary-air device (pay attention to the direction of flow).

3. Electrical test:
Disconnect plug from auxiliary-air device.
Connect ohmmeter to both terminals of auxiliary-air device:
Test specification
up to 8.82: 30...65 Ω
as of 8.82: 20...55 Ω
If reading not within tolerance, replace auxiliary-air device.

yes

Continued on K9/K10



Arrow=Auxiliary-air device

K7

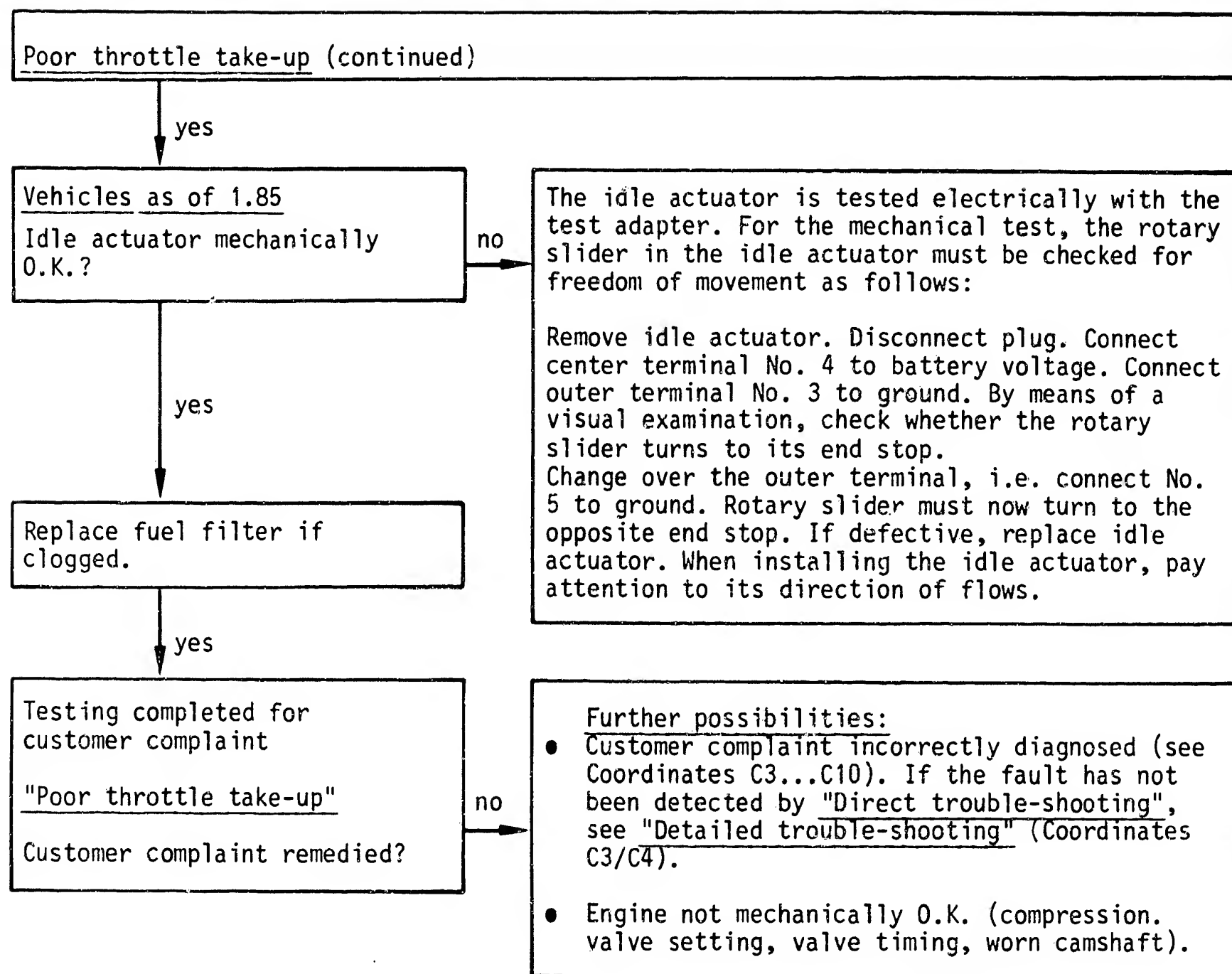
Poor throttle take-up
Porsche 944 (USA)



K8

Poor throttle take-up
Porsche 944 (USA)





Arrow=Idle actuator

K9

Poor throttle take-up
Porsche 944 (USA)



K10

Poor throttle take-up
Porsche 944 (USA)



ENGINE MISSING UNDER ALL OPERATING CONDITIONS

Trouble-shooting program according to customer complaint

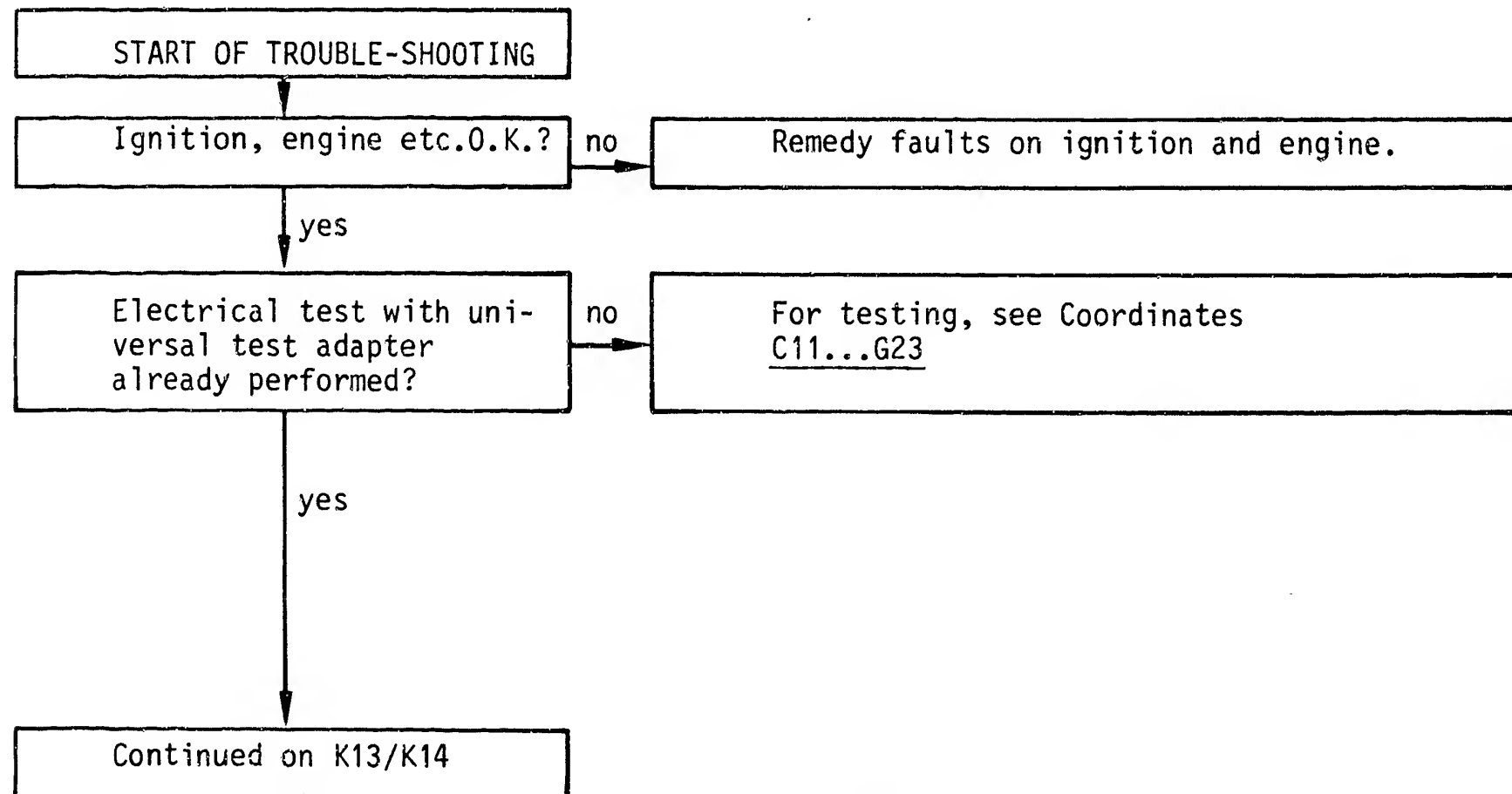
Procedure

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- The center row describes the testing and adjusting operations on the components.
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K11

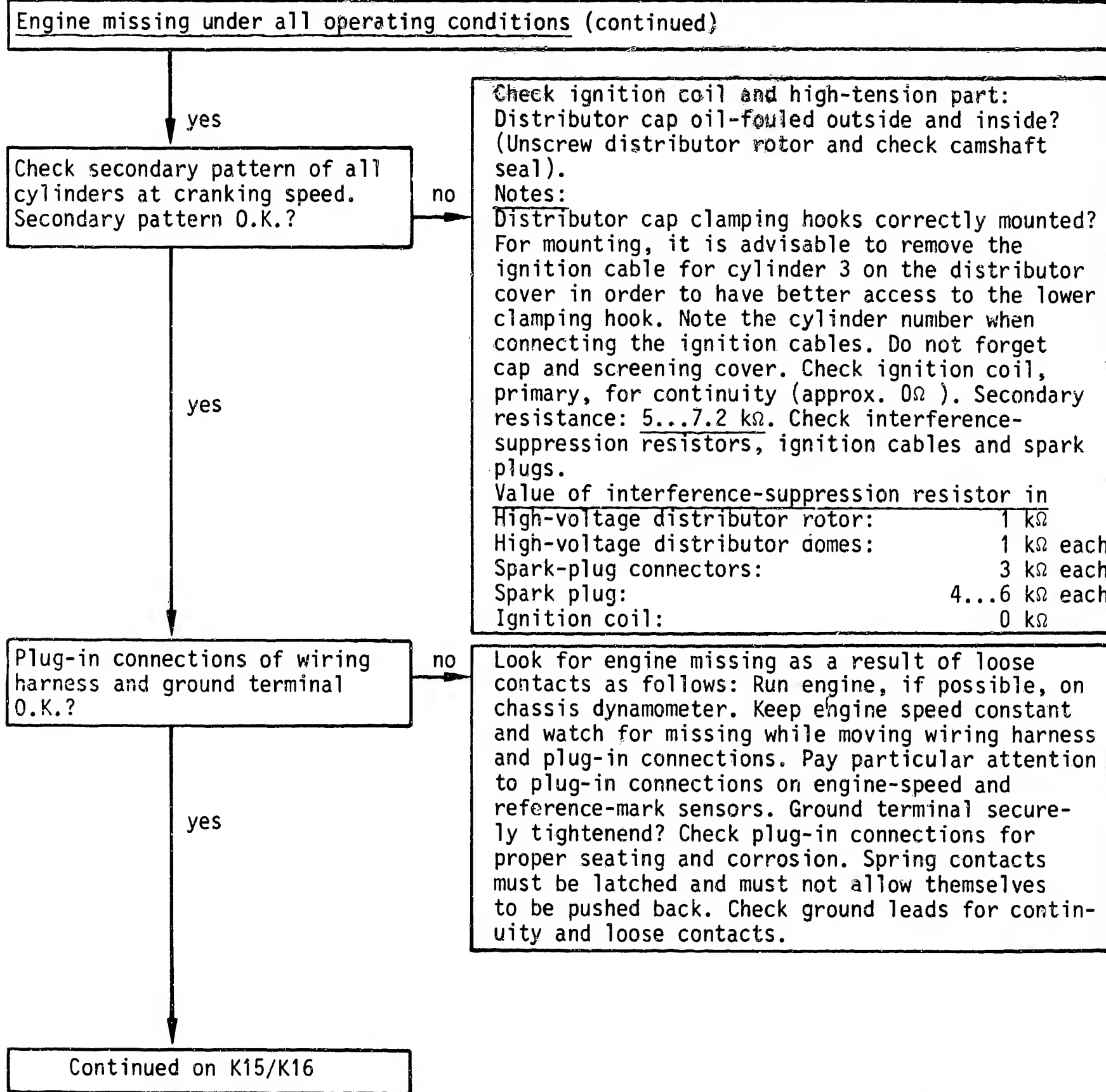
Engine missing under all op. conditions
Porsche 944 (USA)



K12

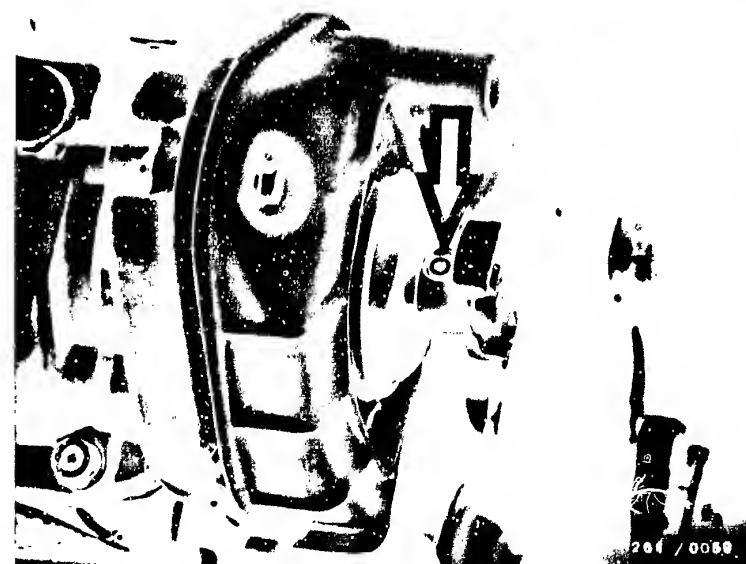
Engine missing under all op. conditions
Porsche 944 (USA)





High-voltage distributor
1 to 4=Cylinder numbers
ZS=High-voltage cable to ignition coil
5=Clamping hook

Arrow=Distributor rotor (screwed)



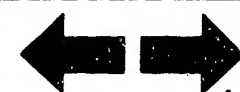
K13

Engine missing
Porsche 944 (USA)



K14

Engine missing
Porsche 944 (USA)



Engine missing under all operating conditions (continued)

yes

Fuel delivery O.K.?

no

Measuring the fuel delivery:

For testing, undo junction between fuel return hose (from pressure regulator) and fuel return line (to fuel tank). If necessary, extend hose and lead into a 5 l vessel with graduated scale.

Switch on fuel pump.

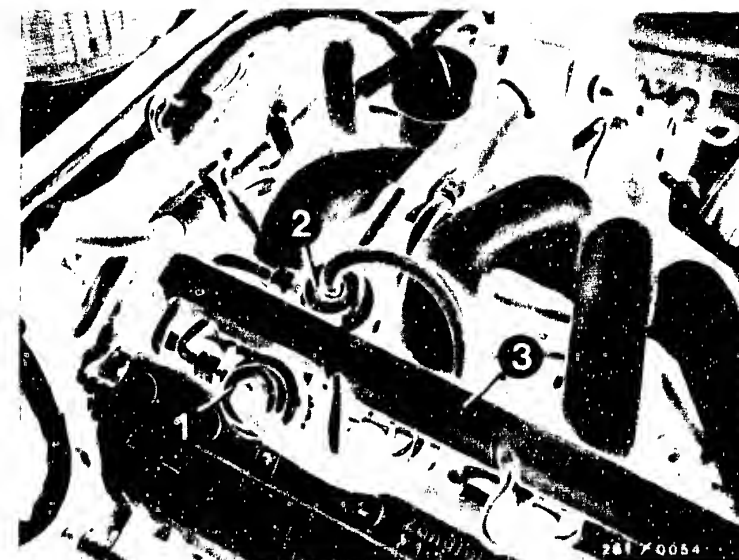
Test specification:

min. 850 cm³/30 s

yes

Continued on K17/K18

Continued on K17/K18



up to 1.85:

1=Pressure regulator

2=Pressure damper

3=Fuel-distribution pipe

4=Air hose to intake manifold

5=Return hose

as of 1.85:

1=Pressure regulator

2=Pressure damper

3=Fuel-distribution pipe

4=Fuel delivery line

5=Return hose



K15

Engine missing
Porsche 944 (USA)



K16

Engine missing
Porsche 944 (USA)



Engine missing under all operating conditions (continued)

yes

Control unit O.K.?

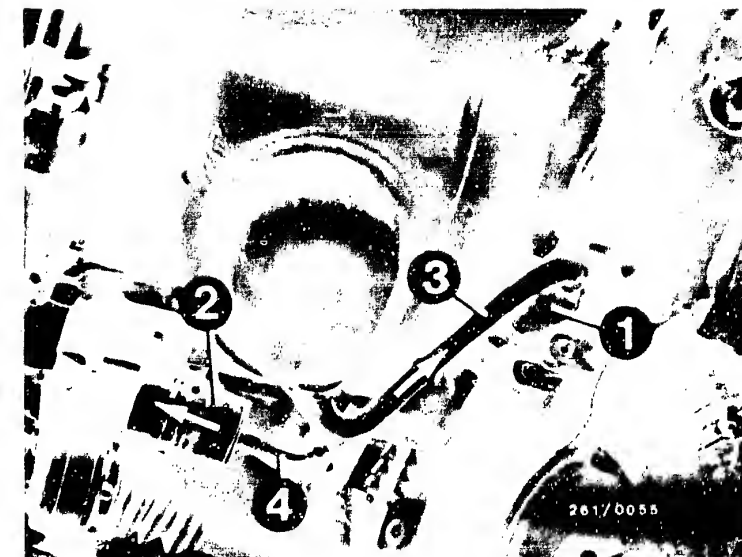
no

Remedy if test specification not obtained

- Fuel filter clogged - replace.
- Voltage at fuel pump plugs with engine running min. 12 V - clean contacts, possibly eliminate poor ground connection. Replace leads.
- Fuel pressure regulator defective - replace.
- Fuel pump delivery too low - replace fuel pump.

Let engine run. Shake control unit lightly and move multiple plug. Watch for engine missing. Repair plug-in connection on multiple plug or replace defective control unit.

Continued on K19/K20



up to 1.85

1=Electric fuel pump

2=Fuel filter

3=Fuel intake line

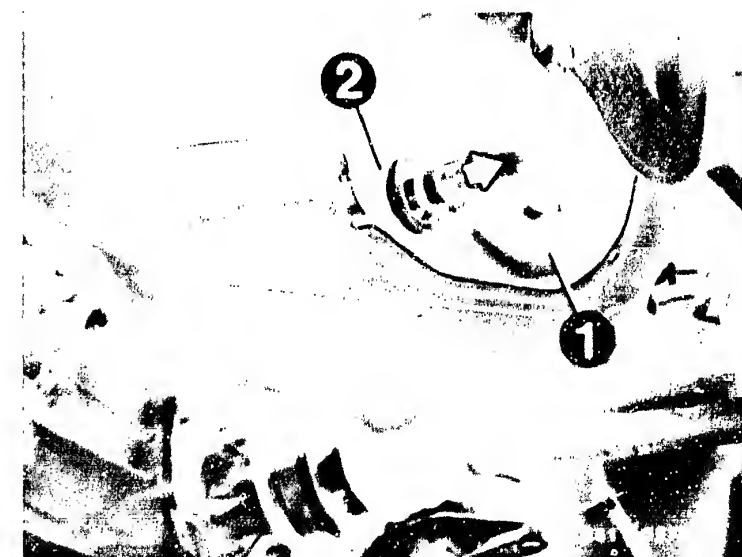
4=Fuel delivery line

Arrow=Direction of fuel flow

as of 1.85

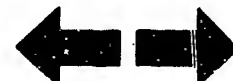
1=Electric fuel pump

2=Fuel filter



K17

Engine missing
Porsche 944 (USA)



K18

Engine missing
Porsche 944 (USA)



Engine missing under all operating conditions (continued)

yes

Air-flow sensor O.K.?

no

Testing:

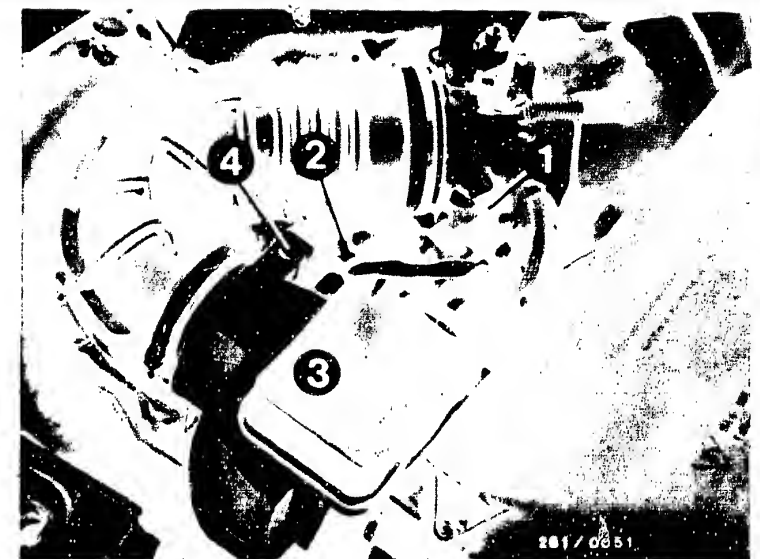
Open air-flow sensor flap by hand. It must be possible to open the sensor flap with uniform ease from its fully closed position to its fully open position. When released, the sensor flap must close again fully by itself. Sensor flap must not catch when opening. Watch for signs of abrasion and rubbing. Clean air-flow sensor if inside is very dirty and rub out with a lint-free cloth. If signs of abrasion or rubbing, replace air-flow sensor.

Potentiometer test (Noise test)

Remove air-flow sensor. Leave plug on. Set motor-tester to "special input" and connect air-flow sensor term. 7 (red clip) and term. 6 (black clip). Set control lever for image adjustment on motortester as far as it will go to the left (calibrated setting). Switch on ignition. Deflect air-flow sensor flap suddenly several times. If air-flow sensor O.K., a continuous stroke signal must be visible on the oscilloscope. If air-flow sensor defective, a noise signal appears similar to the one shown opposite. Replace air-flow sensor. After testing, check spring contacts for security.

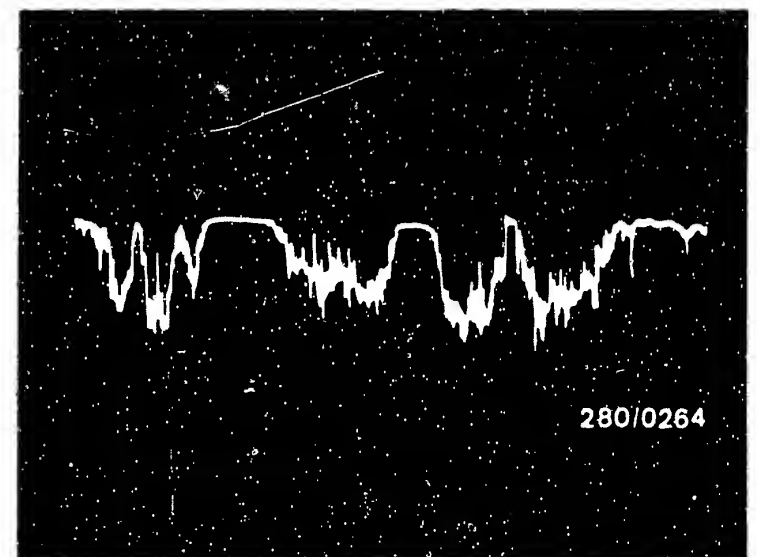
yes

Continued on K21/K22



- 1=Throttle-valve switch
- 2=Engine temperature sensor (NTC II)
- 3=Air-flow sensor with NTC I
- 4=Idle-mixture-adjusting screw

Noise signal if air-flow sensor defective



K19

Engine missing
Porsche 944 (USA)

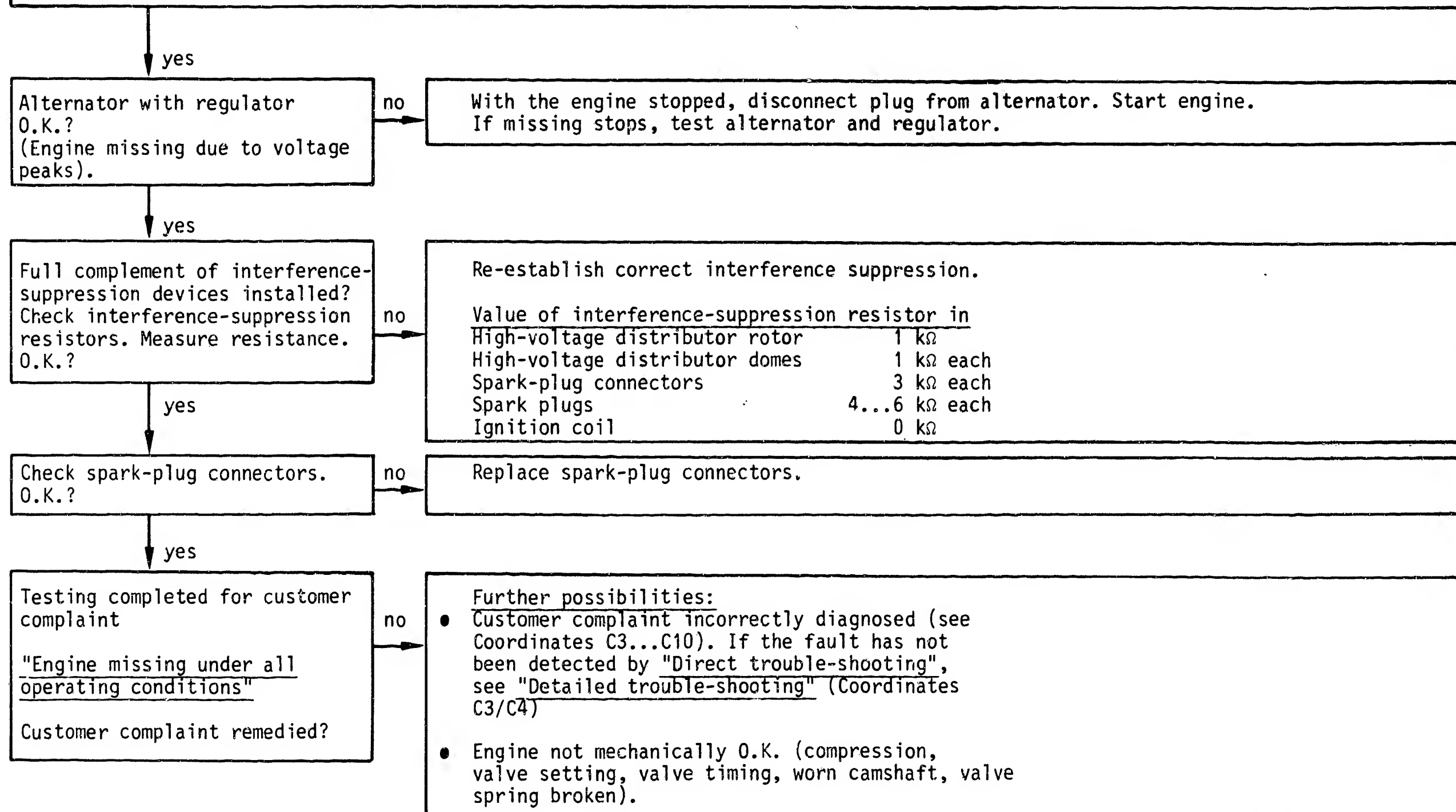


K20

Engine missing
Porsche 944 (USA)



Engine missing under all operating conditions (continued)



FUEL CONSUMPTION TOO HIGH

Trouble-shooting program according to customer complaint

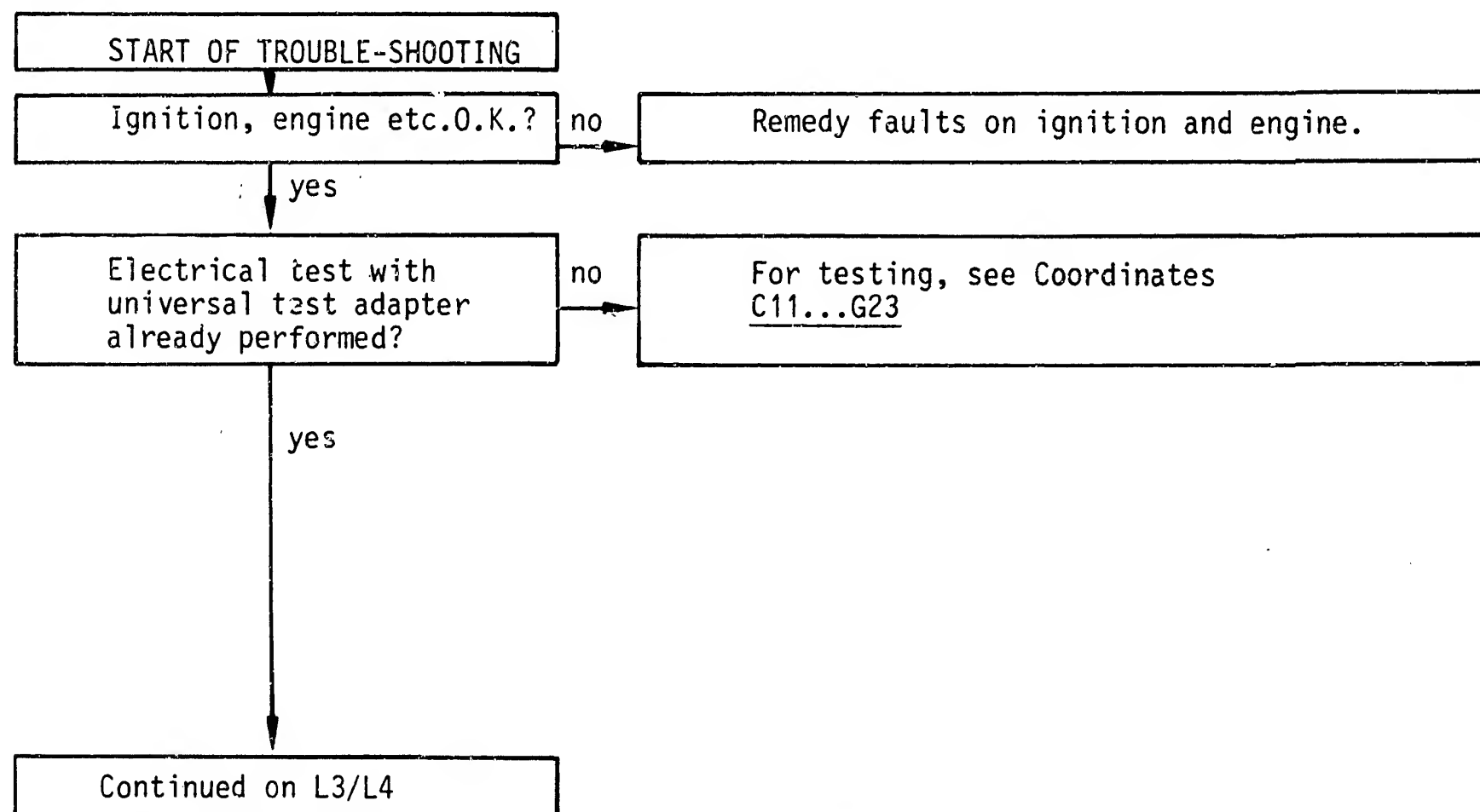
Procedure

The test is divided into 3 rows of boxes:

- The left-hand row contains the questions on the tests.
- The center row describes the testing and adjusting operations on the components.
- The right-hand row shows the illustrations belonging to the text and explains the illustrations.

If the questions can be answered conclusively with "yes" without testing, proceed to the next question down.

If, on the other hand, the answer to the question is "no" and you suspect a fault, branch to the center row of boxes and carry out the tests given there. After testing, continue trouble-shooting at the point at which you branched off.



L1

Fuel consumption too high
Porsche 944 (USA)



L2

Fuel consumption too high
Porsche 944 (USA)



Fuel consumption too high (continued)

yes

Check secondary pattern of all cylinders at cranking speed. Secondary pattern O.K.?

no

Check ignition coil and high-tension part: Distributor cap oil-fouled outside and inside? (Unscrew distributor rotor and check camshaft seal).

Notes:

Distributor cap clamping hooks correctly mounted? For mounting, it is advisable to remove the ignition cable for cylinder 3 on the distributor cover in order to have better access to the lower clamping hook. Note the cylinder number when connecting the ignition cables. Do not forget cap and screening cover. Check ignition coil, primary, for continuity (approx. $0\ \Omega$). Secondary resistance: $5...7.2\ k\Omega$. Check interference-suppression resistors, ignition cables and spark plugs.

Value of interference-suppression resistor in	
High-voltage distributor rotor:	$1\ k\Omega$
High-voltage distributor domes:	$1\ k\Omega$ each
Spark-plug connectors:	$3\ k\Omega$ each
Spark plug:	$4...6\ k\Omega$ each
Ignition coil:	$0\ k\Omega$

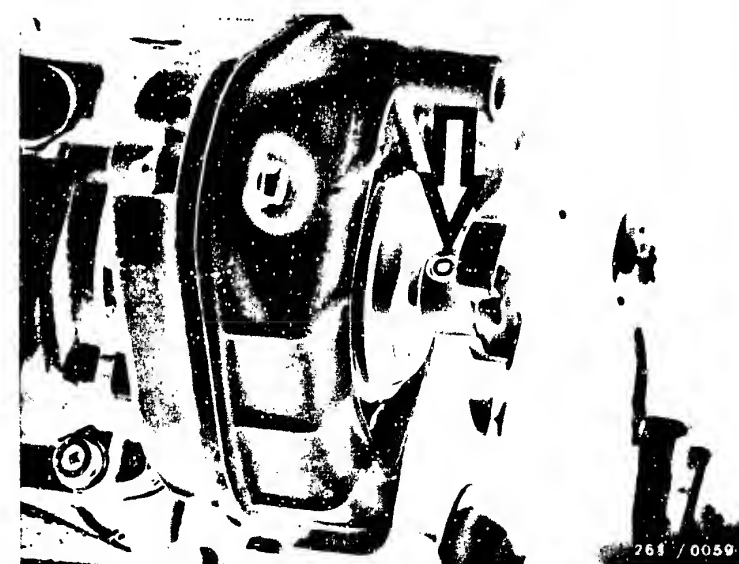
yes

Continued on L5/L6



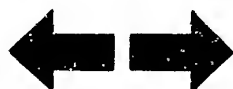
High-voltage distributor
1 to 4=Cylinder numbers
ZS=High-tension cable to ignition coil
5=Clamping hook

Arrow=Distributor rotor (screwed)



L3

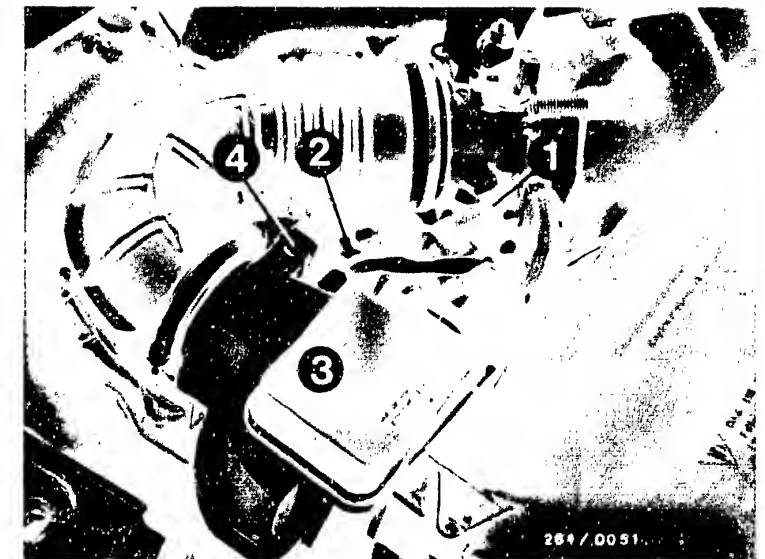
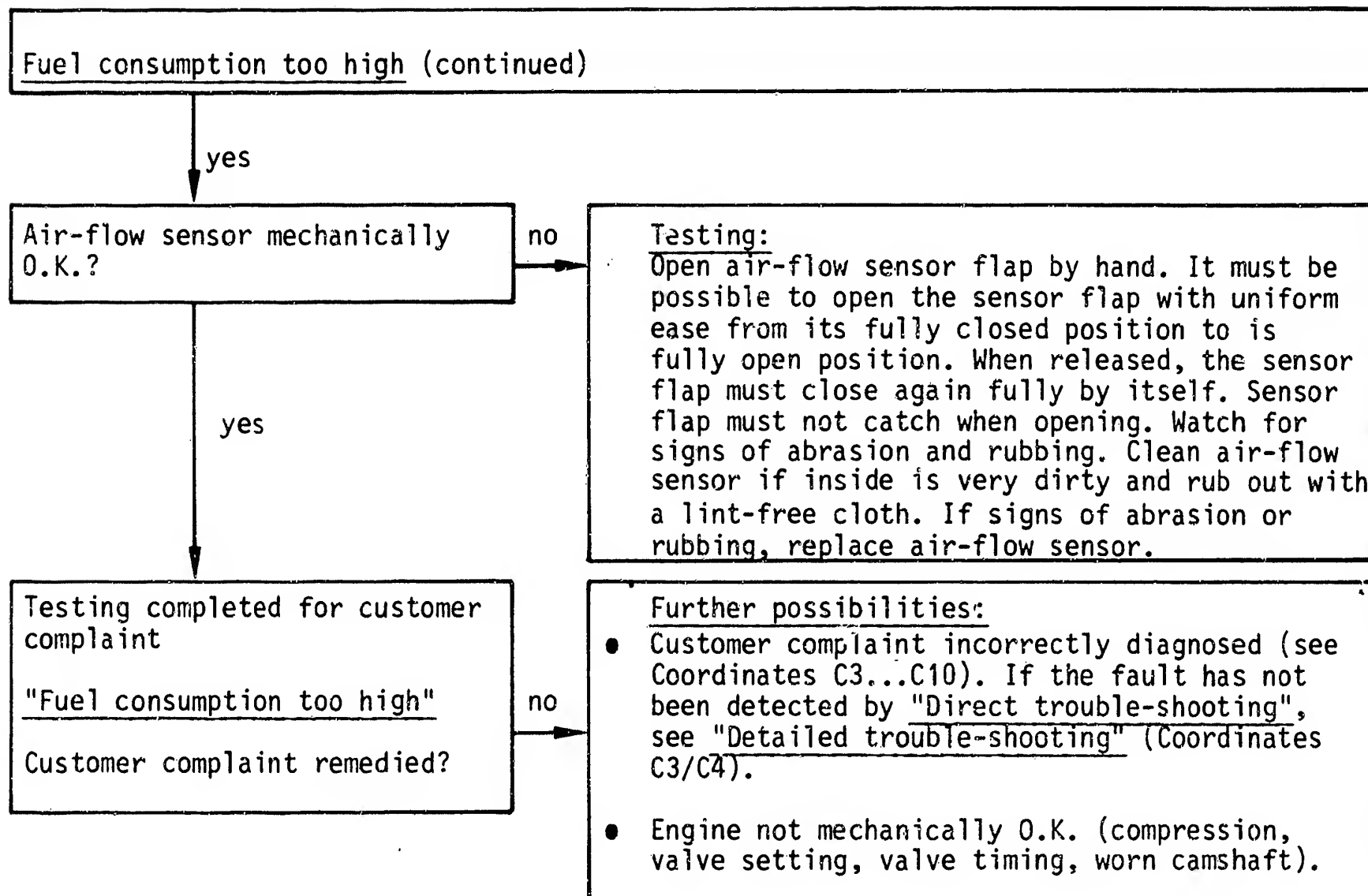
Fuel consumption too high
Porsche 944 (USA)



L4

Fuel consumption too high
Porsche 944 (USA)





1=Throttle-valve switch
2=Temperature sensor (NTC II)
3=Air-flow sensor with NTC I
4=Idle-mixture-adjusting screw

L5

Fuel consumption too high
Porsche 944 (USA)



L6

Fuel consumption too high
Porsche 944 (USA)



MAXIMUM ENGINE POWER/TOP SPEED NOT REACHED

Trouble-shooting program according to customer complaint

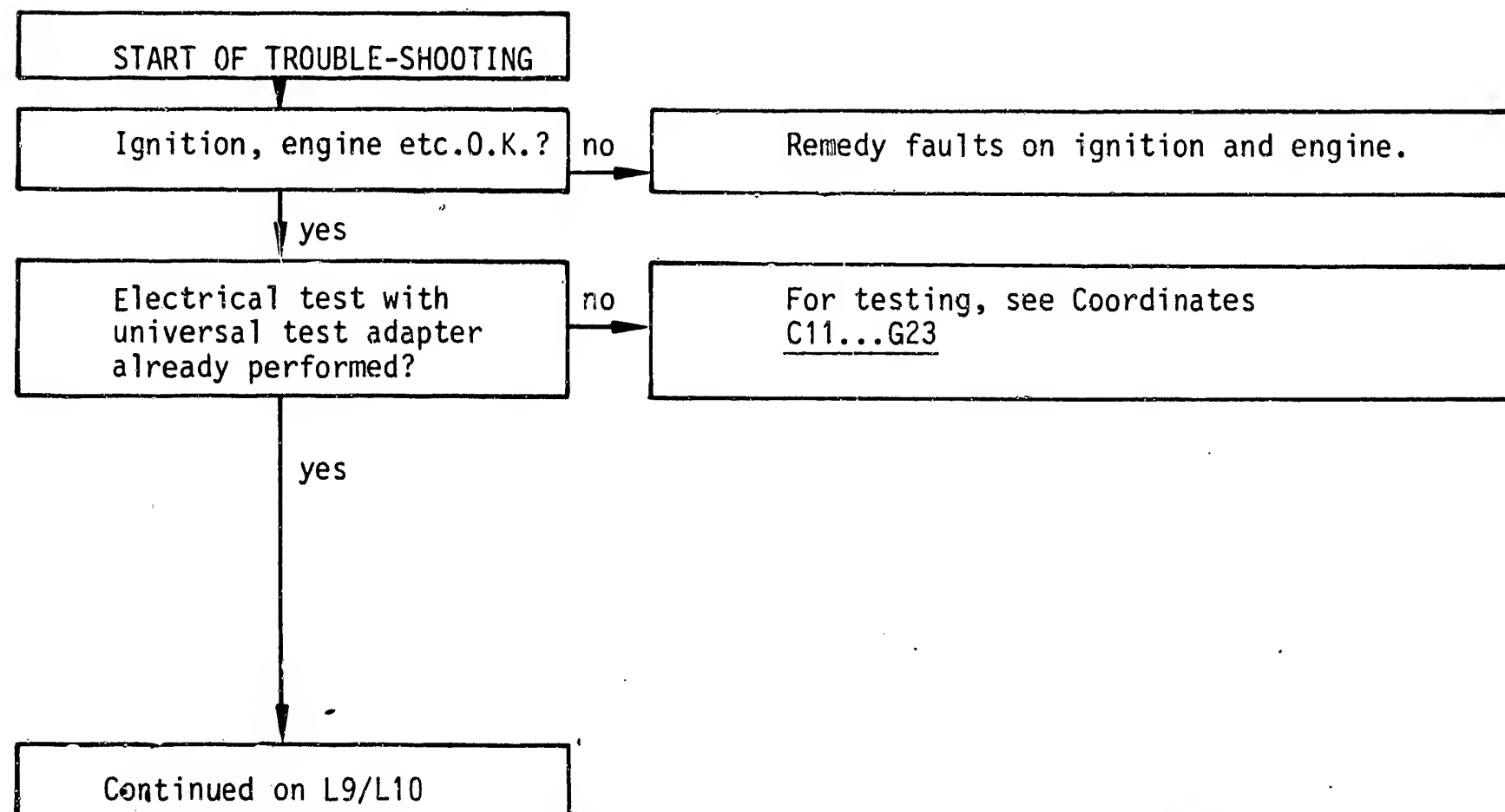
Procedure

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- The right-hand row shows the illustrations belonging to the text and explains the illustrations.

If the questions can be answered conclusively with "yes" without testing, proceed to the next question down.

If, on the other hand, the answer to the question is "no" and you suspect a fault, branch to the center row of boxes and carry out the tests given there. After testing, continue trouble-shooting at the point at which you branched off.



L7

No maximum engine power
Porsche 944 (USA)



L8

No maximum engine power
Porsche 944 (USA)



Maximum engine power/top speed not reached (continued)

yes

Check secondary pattern of all cylinders at cranking speed. Secondary pattern O.K.?

no

Check ignition coil and high-tension part: Distributor cap oil-fouled outside and inside? (Unscrew distributor rotor and check camshaft seal).

Notes:

Distributor cap clamping hooks correctly mounted? For mounting, it is advisable to remove the ignition cable for cylinder 3 on the distributor cover in order to have better access to the lower clamping hook. Note the cylinder number when connecting the ignition cables. Do not forget cap and screening cover. Check ignition coil, primary, for continuity (approx. 0Ω). Secondary resistance: $5...7.2\text{ k}\Omega$. Check interference-suppression resistors, ignition cables and spark plugs.

Value of interference-suppression resistor in

High-voltage distributor rotor:	$1\text{ k}\Omega$
High-voltage distributor domes:	$1\text{ k}\Omega$ each
Spark-plug connectors:	$3\text{ k}\Omega$ each
Spark plug:	$4...6\text{ k}\Omega$ each
Ignition coil:	$0\text{ k}\Omega$

yes

Throttle valve opening fully?

no

Throttle linkage, accelerator O.K.? If necessary, straighten throttle linkage. Accelerator may stick due to floor mat etc. Adjust throttle cable. In vehicle with automatic transmission, check pressure point for kickdown.

yes

Continued on L11/L12



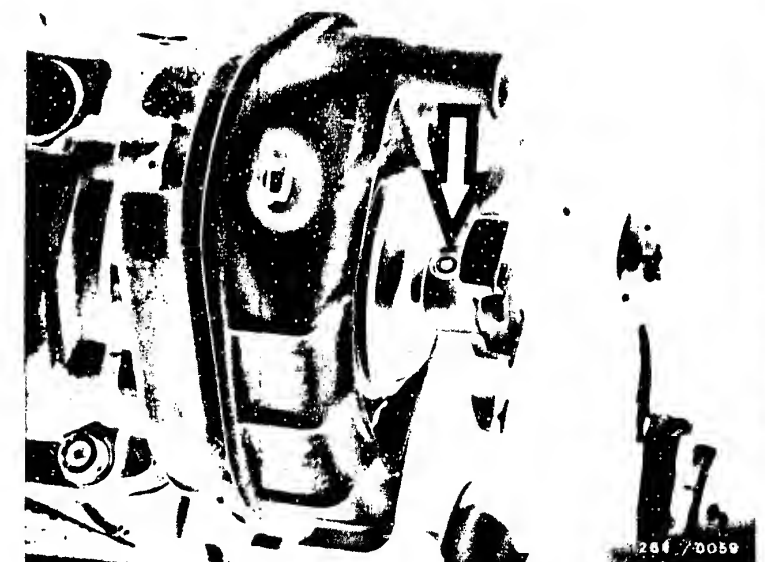
High-voltage distributor

1 to 4=Cylinder numbers

ZS=High-tension cable to ignition coil

5 =Clamping hook

Arrow=Distributor rotor (screwed)



L9

No maximum engine power
Porsche 944 (USA)



L10

No maximum engine power
Porsche 944 (USA)



Maximum engine power/top speed not reached (continued)

yes

Fuel pressure at full load
O.K.?

no

Check fuel pressure on chassis dynamometer at
rated speed and rated output.
Connect pressure gauge to test connection on
fuel-distribution pipe.

Caution:

Pay attention to built-in ball when opening
the cap nut.

Catch escaping gasoline.

Fire hazard if engine hot and electrical
sparks.

Test specification at full load: 2.3...2.7 bar
(Reading may fluctuate slightly).

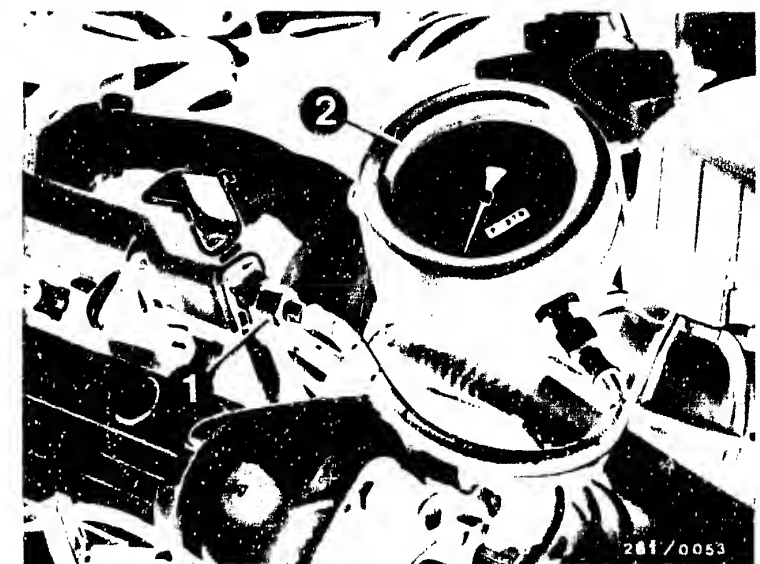
Remedy if test specification not obtained:

- Fuel filter clogged - replace.
- Voltage at fuel pump plugs with engine
running min. 12 V. If not, clean contacts,
possibly eliminate poor connection, replace
leads.

yes

Continued on L13/L14

Continued on L13/L14

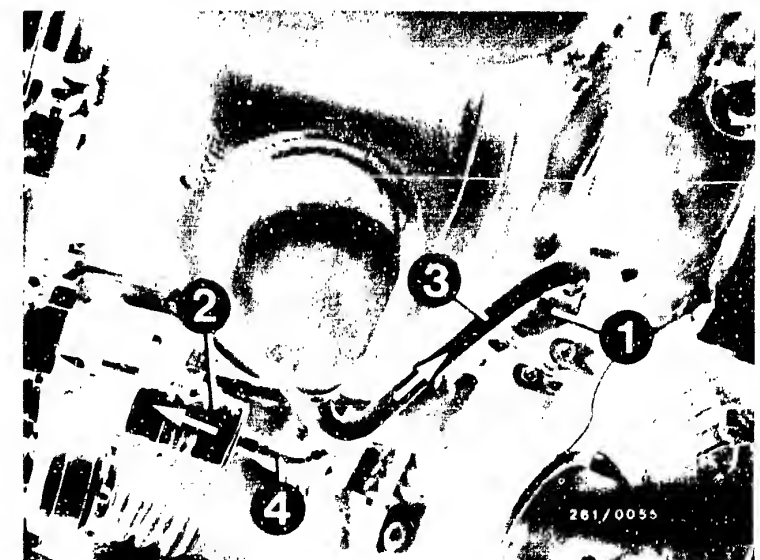


1=Test connection
2=Pressure gauge

up to 1.85:

1=Fuel pump
2=Fuel filter
3=Fuel intake line
4=Fuel delivery line

Arrows=Direction of fuel flow



L11

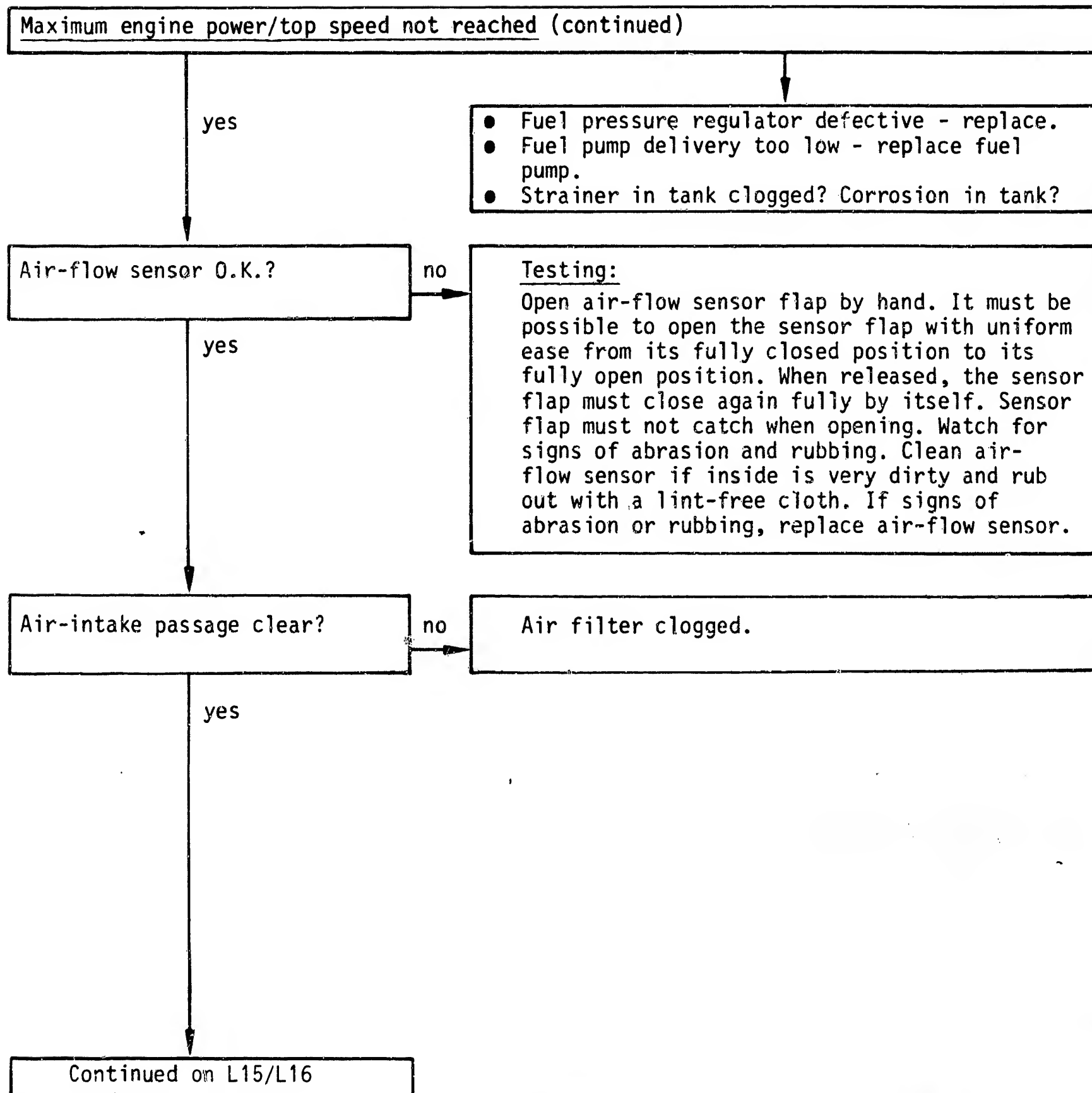
No maximum engine power
Porsche 944 (USA)



L12

No maximum engine power
Porsche 944 (USA)





as of 1.85

1=Electric fuel pump

2=Fuel filter

Arrow=Direction of fuel flow

1=Throttle-valve switch

2=Engine temperature sensor (NTC II)

3=Air-flow sensor with NTC I

4=Idle-mixture-adjusting screw



L13

No maximum engine power

Porsche 944 (USA)



L14

No maximum engine power

Porsche 944 (USA)



Maximum engine power/top speed not reached (continued)

yes

Fuel delivery O.K.?

no

Measuring the fuel delivery:

For testing, undo junction between fuel return hose (from pressure regulator) and fuel return line (to fuel tank). If necessary, extend hose and lead into a 5 l vessel with graduated scale.

Switch on fuel pump

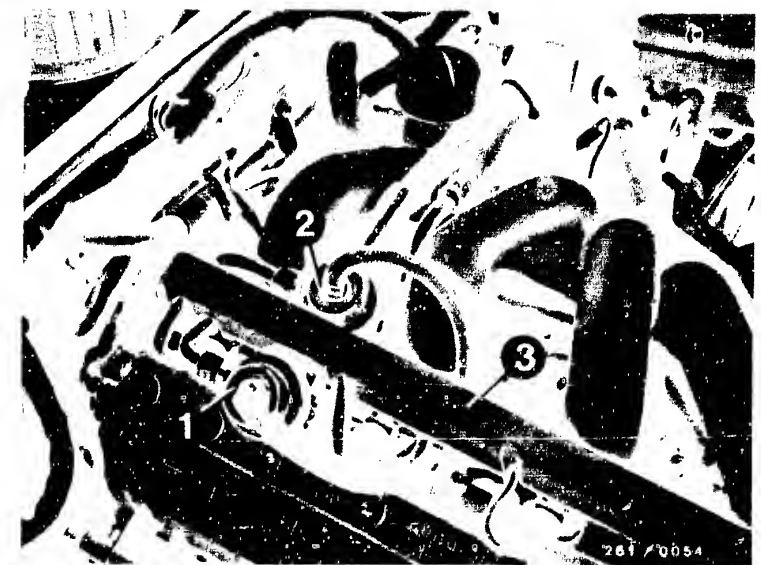
Test specification:

min. 850 cm³/30 s

yes

Continued on L19/L20

Continued on L19/L20



up to 1.85:

1=Pressure regulator

2=Pressure damper

3=Fuel-distribution pipe

4=Air hose to intake manifold

5=Return hose

as of 1.85:

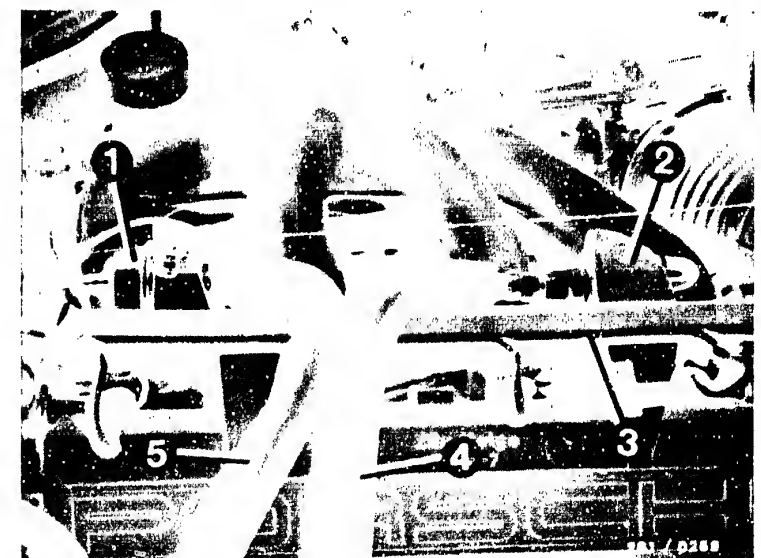
1=Pressure regulator

2=Pressure damper

3=Fuel-distribution pipe

4=Fuel delivery line

5=Return hose



L15

No maximum engine power
Porsche 944 (USA)



L16

No maximum engine power
Porsche 944 (USA)



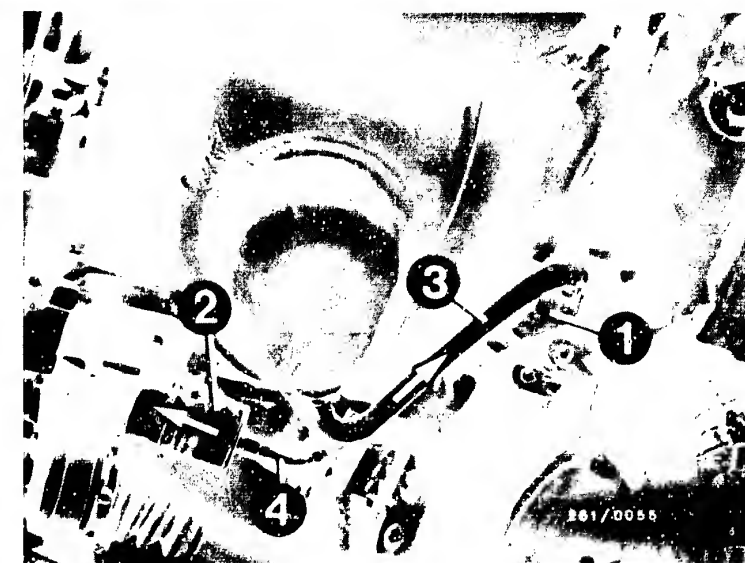
Maximum engine power/top speed not reached (continued)

Remedy if test specification not obtained

- Fuel filter clogged - replace.
- Voltage at fuel pump plugs with engine running min. 12 V - clean contacts, possibly eliminate poor ground connection. Replace leads.
- Fuel pressure regulator defective - replace.
- Fuel pump delivery too low - replace fuel pump.

yes

Continued on L19/L20



up to 1.85

1=Electric fuel pump

2=Fuel filter

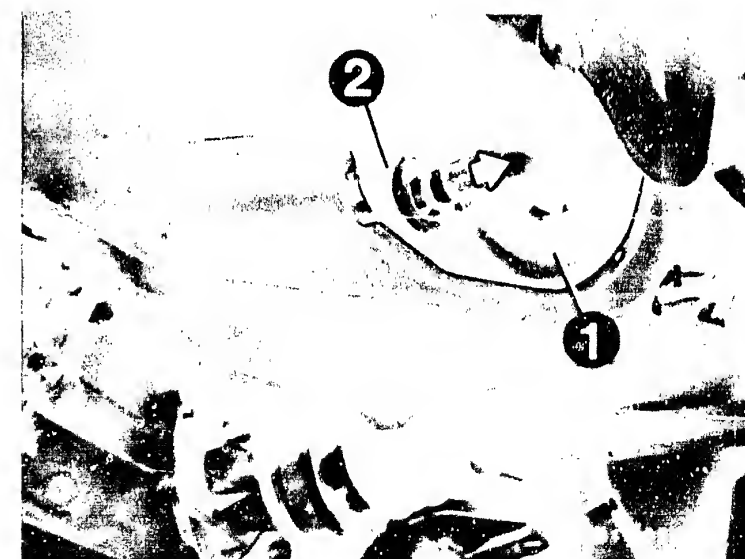
3=Fuel intake line

Arrow=Direction of fuel flow

as of 1.85

1=Electric fuel pump

2=Fuel filter



L17

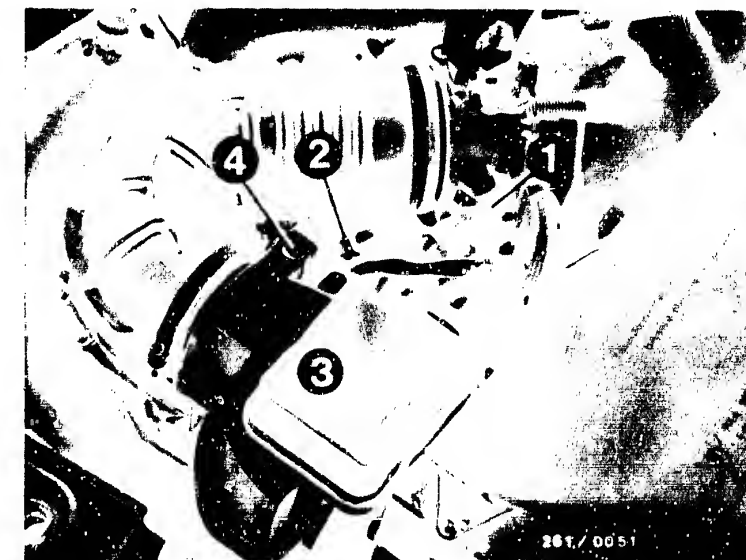
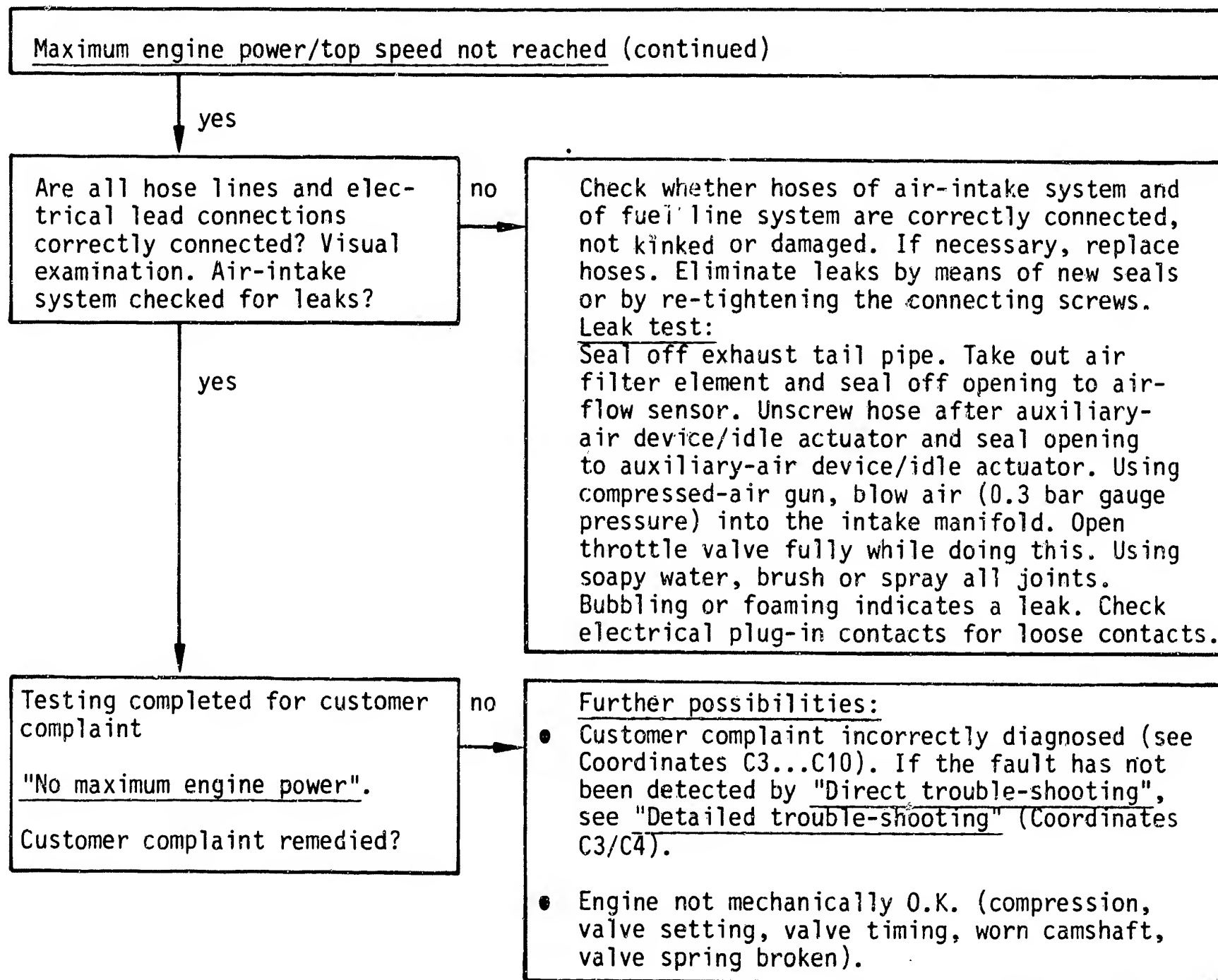
No maximum engine power
Porsche 944 (USA)



L18

No maximum engine power
Porsche 944 (USA)





1=Throttle-valve switch
 2=Engine temperature sensor (NTC II)
 3=Air-flow sensor with NTC I
 4=Idle-mixture-adjusting screw

L19

No maximum engine power
 Porsche 944 (USA)



L20

No maximum engine power
 Porsche 944 (USA)



CO ADJUSTMENT AT IDLE TOO LOW OR TOO HIGH

Trouble-shooting program according to customer complaint

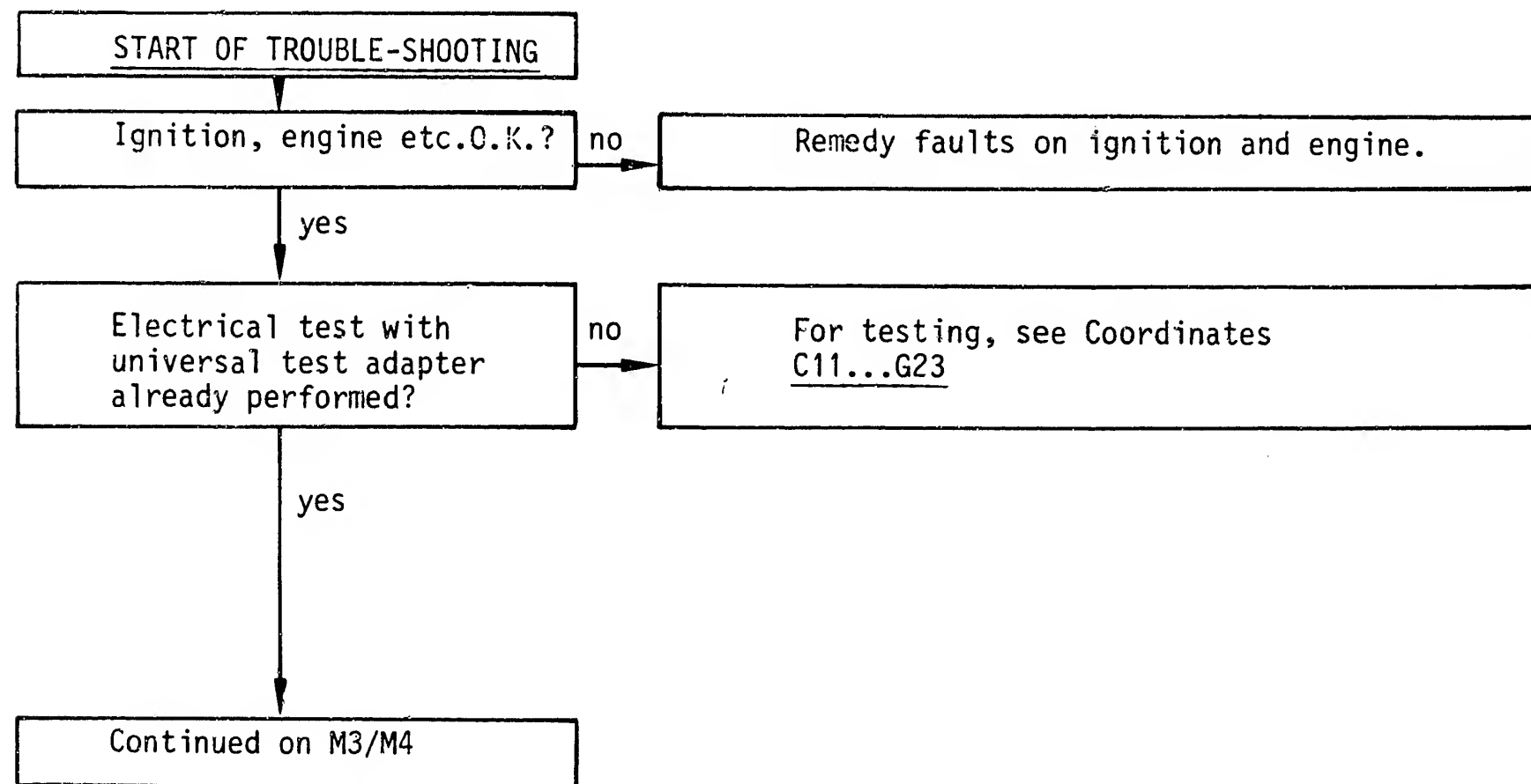
Procedure

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If, on the other hand, the answer to the question is "no" and you suspect a fault, branch to the center row of boxes and carry out the tests given there. After testing, continue trouble-shooting at the point at which you branched off.



M1

CO adjustment
Porsche 944 (USA)



M2

CO adjustment
Porsche 944 (USA)



CO adjustment at idle too low or too high (continued)

yes

Check secondary pattern of all cylinders at cranking speed. Secondary pattern O.K.?

no

Check ignition coil and high-tension part: Distributor cap oil-fouled outside and inside? (Unscrew distributor rotor and check camshaft seal).

Notes:

Distributor cap clamping hooks correctly mounted? For mounting, it is advisable to remove the ignition cable for cylinder 3 on the distributor cover in order to have better access to the lower clamping hook. Note the cylinder number when connecting the ignition cables. Do not forget cap and screening cover. Check ignition coil, primary, for continuity (approx. 0 Ω). Secondary resistance: 5...7.2 k Ω . Check interference-suppression resistors, ignition cables and spark plugs.

Value of interference-suppression resistor in

High-voltage distributor rotor:	1 k Ω
High-voltage distributor domes:	1 k Ω each
Spark-plug connectors:	3 k Ω each
Spark plug:	4...6 k Ω each
Ignition coil:	0 k Ω

yes

Air-flow sensor O.K.?

no

Testing:

Open air-flow sensor flap by hand. It must be possible to open the sensor flap with uniform ease from its fully closed position to its fully open position. When released, the sensor flap must close again fully by itself. Sensor flap must not catch when opening. Watch for signs of abrasion and rubbing. Clean air-flow sensor if inside is very dirty and rub out with a lint-free cloth. If signs of abrasion or rubbing, replace air-flow sensor.

yes

Continued on M5/M6



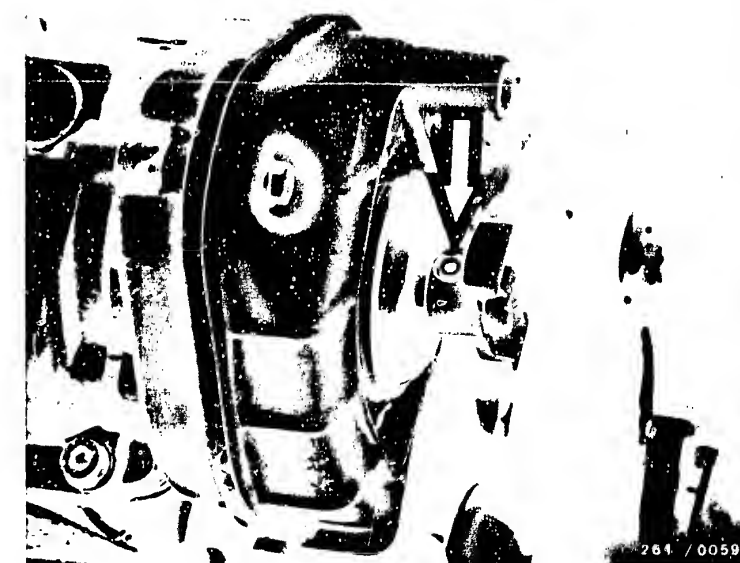
High-voltage distributor

1 to 4=Cylinder numbers

ZS=High-tension cable to ignition coil

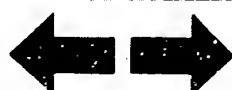
5 =Clamping hook

Arrow=Distributor rotor (screwed)



M3

CO adjustment
Porsche 944 (USA)



M4

CO adjustment
Porsche 944 (USA)



CO adjustment at idle too low or too high (continued)

yes

Are all hose lines and electrical lead connections correctly connected? Visual examination. Air-intake system checked for leaks?

no

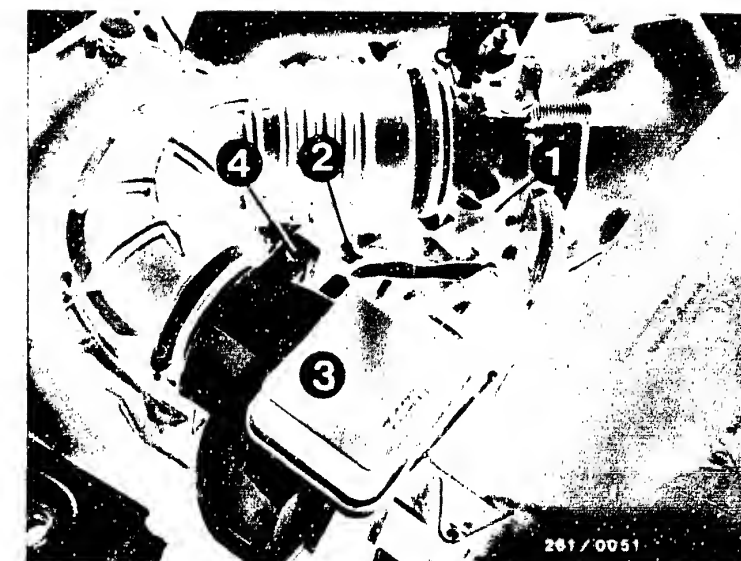
Check whether hoses of air-intake system and of fuel line system are correctly connected, not kinked or damaged. If necessary, replace hoses. Eliminate leaks by means of new seals or by re-tightening the connecting screws.

Leak test:

Seal off exhaust tail pipe. Take out air filter element and seal off opening to air-flow sensor. Unscrew hose after auxiliary-air device/idle actuator and seal opening to auxiliary-air device/idle actuator. Using compressed-air gun, blow air (0.3 bar gauge pressure) into the intake manifold. Open throttle valve fully while doing this. Using soapy water, brush or spray all joints. Bubbling or foaming indicates a leak. Check electrical plug-in contacts for loose contacts.

yes

Continued on M7/M8



- 1=Throttle-valve switch
- 2=Engine temperature sensor (NTC II)
- 3=Air-flow sensor with NTC I
- 4=Idle-mixture-adjusting screw

M5

CO adjustment
Porsche 944 (USA)



M6

CO adjustment
Porsche 944 (USA)



CO adjustment at idle too low or too high (continued)

yes

Exhaust-gas test with CO analyzer with engine at normal operating temperature. Electric loads off. Ambient temperature +15°C to +35°C.

Set value:
0.4 ... 0.8 vol.%CO

(measured before catalytic converter, lambda sensor plug connection taken apart). Carry out adjusting operations as quickly as possible so that the intake passages do not heat up too much, thereby making the CO reading incorrect. The intake-air temperature must be between +15°C and +35°C in order to guarantee correct adjustment.

no

Remove plastic plug in air-flow sensor with special tool.

- CO concentration too low:
Turn bypass screw in air-flow sensor step by step in a clockwise direction (turn to the right).
- CO concentration too high:
Turn bypass screw in air-flow sensor step by step in a counterclockwise direction (turn to the left).

After adjusting, use new plug, and grease cap nut and screw onto test connection.

yes

Testing completed for customer complaint

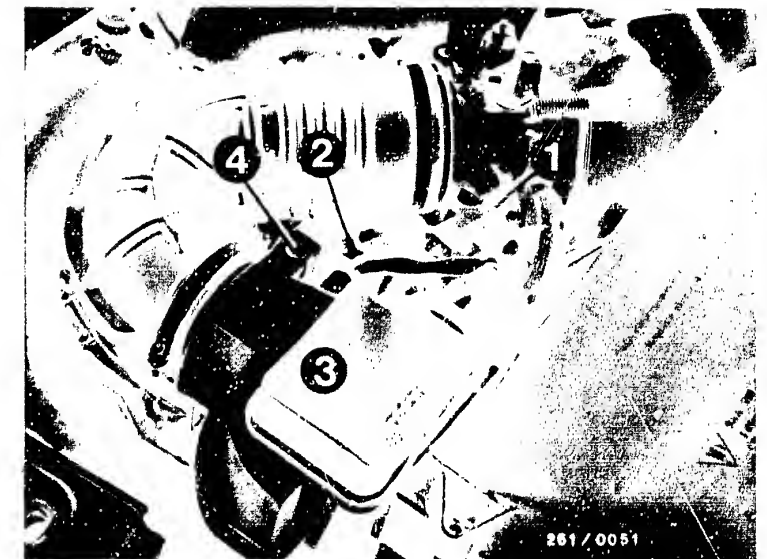
"CO adjustment at idle too low or too high"

Customer complaint remedied?

no

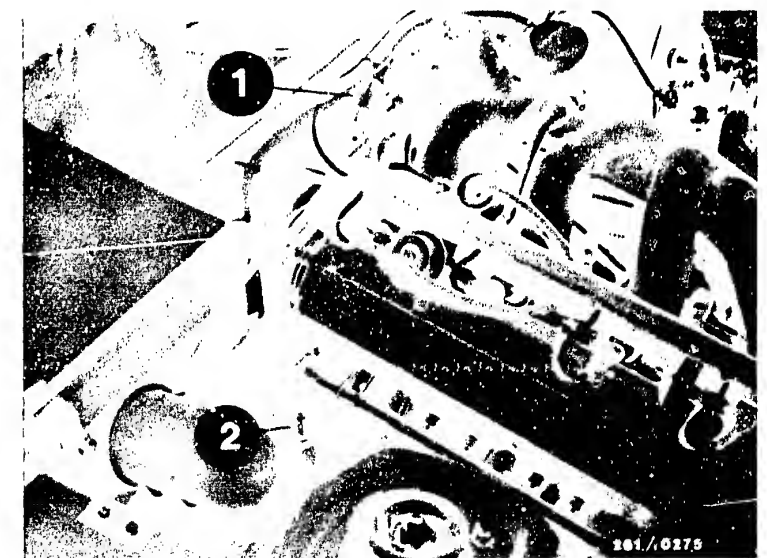
Further possibilities:

- Customer complaint incorrectly diagnosed (see Coordinates C3...C10). If the fault has not been detected by "Direct trouble-shooting", see "Detailed trouble-shooting" (Coordinates C3/C4).
- Engine not mechanically O.K. (compression, valve setting, valve timing, worn camshaft).



1=Throttle-valve switch
2=Engine temperature sensor (NTC II)
3=Air-flow sensor with NTC I
4=Idle-mixture-adjusting screw

1=Plug connector of lambda sensor
2=Lambda sensor



M7

CO adjustment
Porsche 944 (USA)



M8

CO adjustment
Porsche 944 (USA)



After-sales Service

Technical Bulletin

13...39

VDT-I-261/102 En

6.1983

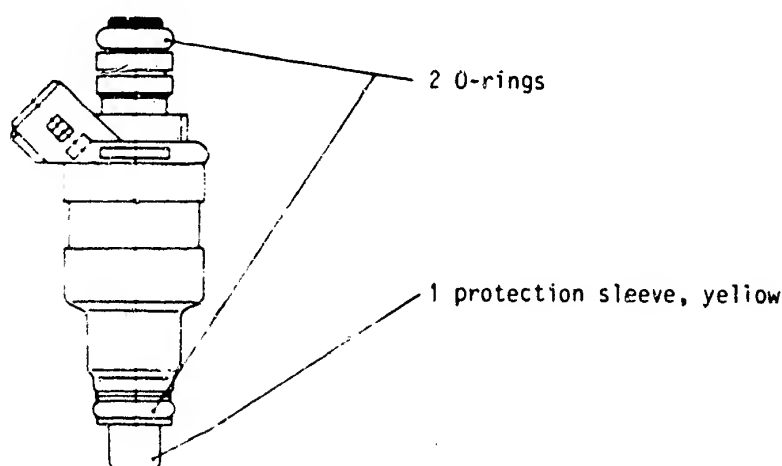
PARTS SET FOR SOLENOID-OPERATED INJECTION VALVES
0 280 150 2..

Supersedes 8.1982 edition

AND PRESSURE REGULATORS 0 280 160 2..

A common parts set is available for the Motronic solenoid-operated injection valves and pressure regulators with the new method of connection.

Contents for 1 injection valve:



Contents for pressure regulator:
1 O-ring
1 supporting plate

Since the above-mentioned parts are subjected to extreme temperature stress, they should be exchanged for new parts whenever servicing is carried out.

"Unmetered air" sucked in through injection-valve seals which are not tight, is a frequent case for servicing.

The parts set has the part number 1 287 010 704 and will in future be listed in the service parts microfiche under solenoid-operated injection valves (see EE 00 under 0 280..).

Please direct questions and comments concerning the contents to our authorized representative in your country.

BOSCH

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N1

Technical Bulletin
Porsche 944 (USA)



TABLE OF CONTENTS

When direct trouble-shooting a specific Motronic component, it is absolutely essential to look up the component under the appropriate customer complaint.

<u>Section</u>	<u>Coordinates</u>
Structure of microfiche.....	A 1
1. Rapid diagnosis chart.....	A 2 - A 16
2. Test specifications.....	A 17 - A 18
3. Electrical terminal diagram.....	A 19 - A 22
4. Installation position of components....	B 1 - B 5
5. Diagram of fuel lines.....	B 6 - B 12
6. Operating principle of altitude sensor.....	B 13
7. Test equipment and tools.....	B 14 - B 15
8. General information.....	B 16 - B 18
9. Trouble-shooting.....	C 1 - C 10
9.1 Detailed trouble-shooting.....	C 3 - C 4
9.2 Direct trouble-shooting.....	C 5 - C 10
10. Test with universal test adapter.....	C 11 - G 23



11. Trouble-shooting program according to customer complaint

<u>Section</u>	<u>Coordinates</u>
<u>STARTING MOTOR OPERATES, ENGINE FAILS TO START OR STARTS ONLY WITH GREAT DIFFICULTY.....</u>	<u>H 1 - H 14</u>
Secondary patterns.....	H 3 - H 4
Injection valves.....	H 3 - H 6
Auxiliary-air device.....	H 7 - H 8
Idle actuator.....	H 9 - H 10
Air-flow sensor.....	H 11 - H 12
Hose lines, electrical lead connections and leak tests.....	H 11 - H 12
 <u>ENGINE STARTS BUT THEN DIES.....</u>	 <u>H 15 - H 24</u>
Hose lines, electrical lead connections and leak tests.....	H 17 - H 18
Auxiliary-air device.....	H 19 - H 20
Idle actuator.....	H 21 - H 22
Air-flow sensor.....	H 23 - H 24
 <u>ROUGH IDLE/INCORRECT IDLE SPEED.....</u>	 <u>J 1 - J 16</u>
Secondary patterns.....	J 3 - J 4
Air-flow sensor.....	J 3 - J 4
Hose lines, electrical lead connections and leak tests.....	J 5 - J 6
Auxiliary-air device.....	J 7 - J 8
Idle actuator.....	J 9 - J 10
Injection valves.....	J 11 - J 12
Idle speed and CO adjustment.....	J 13 - J 16



<u>Section</u>	<u>Coordinates</u>
<u>POOR THROTTLE TAKE-UP</u>	K 1 - K 10
Secondary patterns.....	K 3 - K 4
Air-flow sensor.....	K 5 - K 6
Hose lines, electrical lead connections and leak tests	K 5 - K 6
Auxiliary-air device.....	K 7 - K 8
Idle actuator.....	K 9 - K 10
 <u>ENGINE MISSING UNDER ALL OPERATING CONDITIONS</u>	 K 11 - K 22
Secondary patterns.....	K 13 - K 14
Plug-in connections.....	K 13 - K 14
Fuel delivery.....	K 15 - K 18
Control unit.....	K 17 - K 18
Air-flow sensor.....	K 19 - K 20
Alternator.....	K 21 - K 22
Interference-suppression devices.....	K 21 - K 22
Spark-plug connectors.....	K 21 - K 22
 <u>FUEL CONSUMPTION TOO HIGH</u>	 L 1 - L 6
Secondary patterns.....	L 3 - L 4
Air-flow sensor.....	L 5 - L 6
 <u>MAXIMUM ENGINE POWER/TOP SPEED NOT REACHED</u>	 L 7 - L 20
Secondary patterns.....	L 9 - L 10
Throttle-valve adjustment.....	L 9 - L 10
Fuel pressure at full load.....	L 11 - L 14
Air-flow sensor.....	L 13 - L 14
Air-intake passage.....	L 13 - L 14
Fuel delivery.....	L 15 - L 18
Hose lines, electrical lead connections and leak tests.....	L 19 - L 20



SectionCoordinatesCO ADJUSTMENT AT IDLE TOO LOW ORTOO HIGH.....M 1 - M 3

Secondary patterns.....M 3 - M 4

Air-flow sensor.....M 3 - M 4

Hose lines and leak tests.....M 5 - M 6

Exhaust-gas adjustment.....M 7 - M 8

Technical Bulletin.....N 1

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